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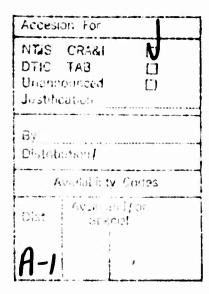
WM. DARRYL HENDERSON COL, IN Commanding

Research accomplished under contract for the Department of the Army

Human Resources Research Organization

Technical review by

David W. Bessemer Ronald E. Kraemer



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	REPORT DOCU	MENTATION	PAGE				
1a. REPORT SECURITY CLASSIFICATION Unclassified		16. RESTRICTIVE	MARKINGS				
20. SECURITY CLASSIFICATION AUTHORITY			AVAILABILITY OF				
2b. DECLASSIFICATION / DOWNGRADING SCHEDU	Approved for public release; distribution unlimited.						
4. PERFORMING ORGANIZATION REPORT NUMBE	S. MONITORING	ORGANIZATION RE	PORT NUMBER(S	3)			
FR-TRD-87-41	ARI Resear	ch Product 8	8-03				
60. NAME OF PERFORMING ORGANIZATION	7a. NAME OF MONITORING ORGANIZATION U.S. Army Research Institute for the						
Human Resources Research		Research Ins		tne			
Organization							
6c. ADDRESS (City, State, and ZIP Code)		7b. ADDRESS (City	y, State, and ZIP C Field Unit	(ode)			
1100 S. Washington Street		Steele Hal					
Alexandria, VA 22314		Fort Knox,	KY 40121				
Ba. NAME OF FUNDING/SPONSORING	8b. OFFICE SYMBOL	9. PROCUREMENT	INSTRUMENT IDE	NTIFICATION NU	MBER		
ORGANIZATION U.S. Army Research Institute	(if applicable) PERI-IK	MDA903-86-	C-0335				
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF F	UNDING NUMBERS				
5001 Eisenhower Avenue Alexandria, VA 22333-5600		PROGRAM ELEMENT NO. 6.37.43.A	PROJECT NO. 20263 743A794	TASK NO. 3.3.1	WORK UNIT ACCESSION NO. 3.3.1.H.1		
11. TITLE (Include Security Classification) Requirements for a Device-Base Volume 2. Detailed Analyses a		Testing Progr	am for M1 Gu	nnery:			
12. PERSONAL AUTHOR(S) John E. Morrison and R. Gene H	offman						
13a TYPE OF REPORT 13b. TIME CO	OVERED TO 11/87	14. DATE OF REPOR	RT <i>(Year, Month, D</i> arch	15. PAGE (COUNT 8		
16. SUPPLEMENTARY NOTATION Contracting Officer's Represent	tative. John A.	Boldovici					
17. COSATI CODES		(Continue on reverse if necessary and identify by block number)					
FIELD GROUP SUB-GROUP							
19. ABSTRACT (Continue on reverse if necessary			>				
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20. DISTRIBUTION/AVAILABILITY OF ABSTRACT MUNCLASSIFIED/UNLIMITED SAME AS RI	PT. DTIC USERS						
John A. Boldovici	ledition may be used unt	22b. TELEPHONE (Include Area Code) 22c. OFFICE SYMBOL 502-624-6928 PERI-IK					

ARI Research Product 88-03

19. Abstract (continued)

appendixes that support the following research activities: (a) definition of the domain of gunnery in terms of individual conditions and actions; (b) identification of gunnery performance deficien ies through an analysis of Directorate of Evaluation and Standardization (DOES) performance data, a review of the research literature, and an analysis of Table VIII performance at Grafenwöhr; (c) identification of training and testing objectives through a hierarchical analysis of the gunnery domain; (d) evaluation of gunnery devices with respect to their fidelity features, instructional features, and testing features; and (e) specification of the training and testing program by a detailed listing of objectives within instructional units.

devices. Curry training. (SDW)

Research Product 88-03

Requirements for a Device-Based Training and Testing Program for M1 Gunnery: Volume 2. Detailed Analyses and Results

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for

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Office, Deputy Chief of Staff for Personnel

Department of the Army

March 1988

Army Project Number 20263743A794

Education and Training

This report is the second of two volumes describing four related activities related to M1 tank crew gunnery performance: (1) analysis of the domain of tactical gunnery, (2) specification of training and testing objectives, (3) content evaluations of four training devices, and (4) development of a training and testing strategy using those training devices.

This research is a part of the task entitled "Application of Technology to Meet Armor Skills Training Needs." That task is performed under the auspices of the Army Research Institute's Armor Research and Development Activity at Fort Knox, whose mission includes optimizing the use of armor training devices for readiness in gunnery and tactics.

The proponent for this research is Training and Doctrine Command (TRADOC), and the user is U.S. Army Armor Center (USAARMC) (letter of agreement with ARI entitled "Establishment of Training Technology Field Activity, Fort Knox, Kentucky," dated 4 November 1983).

Plans for, and progress on, this project have been disseminated through briefings to the Assistant Commandant, Technical Director, and Department Heads of the U.S. Army Armor School at Fort Knox. Project scientists also made informal presentations to the Director of the Armor School Directorate of Training Developments (DOTD), and to ORSA (Operations Research and Systems Analysis) personnel. Additional presentations are being planned for DOTD personnel and the American Psychological Association.

The research provides information complementary to current emphases and proposals regarding armor device training strategies. The gunnery training objectives, summaries of device capabilities and limitations, and procedures for developing device-based training will be useful at all levels of training and testing development for armor crews.

EDGAR M. JOHNSON Technical Director

REQUIREMENTS FOR A DEVICE-BASED TRAINING AND TESTING PROGRAM FOR M1 GUNNERY: VOLUME 2. DETAILED ANALYSES AND RESULTS

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REQUIREMENTS FOR A DEVICE-BASED TRAINING AND TESTING PROGRAM FOR M1 GUNNERY: VOLUME 2. DETAILED ANALYSES AND RESULTS

Introduction

The advanced technology incorporated in the M1 tank has changed the way gunnery tasks are performed. For instance, the lead sensor system detects the angular velocity of the turret and automatically adjusts the sight/target relationship to apply the appropriate lead to moving targets. Similarly, once activated, the laser range finder determines the target range and automatically inputs the result into the ballistic solution. As a result of these innovations, the gunner is no longer required to lead moving targets or to estimate target ranges, both of which are difficult skills. On the other hand, this new technology creates new responsibilities for the armor crewman. For instance, he must now know how to detect failures in any of these systems and what to do in case of such failures.

Technology has also changed the way gunnery is trained. Older tankappended training devices provide practice and feedback on limited aspects of the domain, namely tracking and aiming the main gun with the power control handles. Recent advances in computer technology has permitted the development of new stand-alone devices that attempt to represent larger segments of the gunnery domain. In the present report, we examine four such computer-based devices that can be used to train M1 gunnery skills: (a) the Videodisc Integrated Gunnery Simulator (VIGS), (b) the arcade-type TopGun device, (c) the Unit Conduct-of-Fire Trainer (U-COFT), and (d) the Simulated Networking (SIMNET) battle simulation system. These devices have the ability to measure performance as well as train skills within the domain of M1 gunnery.

The purpose of the present research was to determine the performance and simulation requirements of an MI gunnery training program and to design an integrated program for training and testing MI gunnery skills using the four designated computer-based devices.

Summary of Volume 1

The first volume of this report (Hoffman & Morrison, 1987) presents the analytic rationale for determining the requirements of the device-base training/testing program plus a summary of the results from the analyses. The research was divided into four major activities: (a) analysis of stimulus conditions and actions related to gunnery, (b) derivation of training and testing objectives, (c) evaluation of device capabilities and limitations, and (d) design of a draft training and testing strategy. In addition, research was performed to identify specific areas of gunnery that may be particularly difficult to learn and may require special training attention. The resulting training and testing strategy indicated the feasibility of the program to train and test much of the domain of tank gunnery in a integrated fashion. However, there were "gaps" in the training program where devices did not support substantial portions of the domain. Also, there were cases where training on basic skills and knowledges was not integrated into training on

higher level skills. It was concluded that on-tank experience at both the beginning and advanced stages of training is necessary to train and/or test the entire domain of gunnery.

Contents of Present Volume

This (the second) volume of the report provides a detailing of the analyses and results that support the research activities described above. These detailed analyses and results are presented as a series of appendixes, each of which is described below in the context of the research activities that they were intended to support.

Domain of Gunnery Behaviors

An initial problem in the research project was to determine the Ml gunnery performance requirements that were subsequently used to derive training and testing objectives as well as to provide criteria for evaluating training devices. The M1 gunnery performance domain was defined in terms of two dimensions: stimulus conditions and behaviors. With regard to the former, 22 different environmental parameters were identified along with the conditions defining each parameter. These conditions and parameters are summarized in Table 2-3 of Volume 1. The analysis of stimulus conditions revealed basic simulation requirements for the devices. The stimulus conditions also aided in our partitioning of the domain of gunnery behaviors, which are detailed in Appendix A of this volume. Individual behaviors (or performance elements) were organized into eleven "activities." For the most part, activities were derived from accepted armor doctrine. For instance, Activities 3 through 10 correspond to chapters and sections within chapters of the gunnery manual (FM 17-12-1). Activities 1 and 2 (related to preparing the tank for operation and for firing, respectively) were taken from the M1 Operator's Manual (TM 2325-255-10-2). Activity 11 (Assess Results of Engagement) were derived from tactical considerations discussed in Division 86 tank platoon (FC 17-15). Many of the activities were further subdivided into "parts" and "options." Parts were used in Target Acquisition to divide the activity into phases (sequentially related groups of elements). Options were used in several activities to indicate alternative courses of actions that are dependent on various mission and equipment status conditions. The basic format of presenting the simultaneous behaviors associated with each of the four crewman in four columns followed the convention of Kraemer (1983) and FM 17-12-1. However, the analysis is more inclusive than either source in both depth and breadth: (a) in depth because greater detail is provided in describing behavior, and (b) in breadth because elements associated with activities beyond pure gunnery are included.

Identification of Gunnery Performance Deficiencies

We originally planned to focus device training on specific deficiencies in gunnery performance. However, as discussed below, identification of specific armor performance deficiencies was more difficult than we expected. After rejecting the idea to survey subject matter experts on the basis of some pilot results, we subsequently sought to identify performance deficiencies using three other information sources that were thought to yield more objective data. These three sources are described below.

Analysis of DOES Survey Data. We examined survey data collected by the Directorate of Evaluation and Standardization (DOES) of the Armor School. Supervisors (n = 23) rated recent OSUT graduates in terms of Skill Level One Soldiers' Manual tasks. These tasks were rated on level of performance (cannot perform, less than adequate, adequate, more than adequate, and exception) and frequency of performance (never performed, seldom performed, performed monthly, performed weekly, performed daily). Correlational analyses indicated a significant correlation between these two ratings (r = .69, p < .69).01) suggesting that, at least from the observations of the raters, task proficiency is dependent on frequency. Furthermore, examination of the frequency-by-performance plot suggested a curvilinear trend. That is, the incremental effects of task frequency on performance are greatest at the low end of frequency and plateau as frequency increases. This was tested by added a curvilinear component (frequency squared) to a multiple regression model. The curvilinear component was significant (p < .05), increasing the prediction of performance to R = .72 (p < .01). In order to obtain an index of task difficulty independent of frequency, residual performance was calculated as the difference between performance level that would be expected based on the curvilinear function of frequency minus actual performance. Results from the analyses, presented in Appendix B, indicate three gunnery related tasks were performed less well than would be predicted by the amount of practice they received: (a) identify threat aircraft, (b) identify friendly and threat armored vehicles, and (c) drive an M1 tank. Gunnery engagement skills, on the other hand, were not singled out as deficient by the residual performance method. Rather they were described as on par with frequency. In other words, there were no deficiencies in gunnery performance that were not also associated with deficiencies in practice.

Review of Research Literature. Unlike most other job domains, there is considerable empirical research on armor gunnery performance. To review this extensive literature, the domain of gunnery was broken down into a number of broad, generally recognized categories of armor skills and knowledges. In that regard, the literature on armor job samples was examined particularly closely since many armor job samples are addressed specifically to these gunnery skills and knowledges components. Unfortunately, the literature has not directly addressed the issue of identifying performance deficiencies. Nevertheless, some findings have addressed two related questions: (a) Is there a relationship between the skill or knowledge and gunnery performance? (b) Does performance on the skill or knowledge improve with experience? Affirmative answers to these questions would identify a gunnery skill or knowledge that is both important and trainable. The results of the review were disappointing in that, with the possible exception of observation skill,

the literature (detailed in Appendix C) failed to identify any skill or knowledge component as unequivocally related to gunnery performance. On the other hand, there was somewhat stronger evidence that at least some of the skill/knowledge components were trainable.

Analysis of Grafenwöhr Gunnery Data Base. Tank Combat Table VIII is a live-fire gunnery test designed to determine whether or not individual crews are qualified. The Office, Chief of Armor (OCOA) maintains a detailed data base on Table VIII performance at Grafenwöhr, one of several sites at which Table VIII is administered. The data base provides information for the Chief of the Armor Branch and serves as a research data for other Army organizations. The data base is a rich and complex source on information on gunnery performance, including information about the crewmembers, the targets, and the test conditions. In many ways, this data base provides an ideal source on information about gunnery performance deficiencies. The data base was manipulated to answer a list of specific questions about gunnery performance. Details of the analysis and the findings are presented in Appendix D. The analysis did provide some findings that may be of interest to the Armor training community. However, as in the previous two analyses, these results failed to reveal specific performance deficiencies that could be addressed by the proposed device-based program.

<u>Hierarchical Skills Analysis of Gunnery Domain</u>

Training and testing objectives for the gunnery domain were derived through a hierarchical skills analysis technique that was modified from one used to identify objectives for a early mathematics education curriculum (Resnick, Wang, & Kaplan, 1973). A skill hierarchy is an analysis of a terminal learning objective its constituent behavioral and enabling objectives. The result is an inverted tree structure with related objectives connected by lines. Analyses of the entire gunnery domain are presented in Appendix E. Each analysis consists of three distinct levels as described below.

The topmost level defines a terminal objective. A terminal objective represents the objective for a unit or subunit of instruction, and corresponds to a major activity or option identified in the task analysis. The terminal objective (as well as all other objectives in the hierarchy) is divided vertically by a line with the stimulus conditions portion of the objective listed above and the actions summarized below the line. The logical operators "&" and "OR" are used to combine the multiple conditions or actions within an objective.

The next level of analysis consists of behavioral objectives. According to our technique, the overall task (activity) is partitioned into meaningful chunks of behavior. Behavioral objectives are outlined by noticeably thicker lines to distinguish them from either terminal or enabling objectives. Arrows are used to indicate sequential dependencies between overt behaviors. Loops are used to indicate that performers must recycle through certain series of

steps. Decision points are represented by splitting the box vertically to indicate different stimulus-response contingencies. Crewman duty title is sometimes provided at this level to clarify who performs a particular action.

The objectives at the lowest level of analysis correspond to enabling skills. These enabling skills are not actually performed in the course of the terminal behavior but are assumed to either be necessary (prerequisite) or helpful (propadeutic) in learning the superordinate objective. Subordinate behaviors may be further analyzed into lower order behaviors until the lowest level of skill not possessed by the training population is reached. Note that even the prerequisite skills are behaviorally defined by specific sets of conditions and actions.

Evaluation of Devices with Respect to Training Requirements

To determine the capabilities of the four designated training devices to train gunnery skills, the devices were evaluated with respect to two general classes of training device features: fidelity features and instructional features. Fidelity features are defined as those simulator components that enable the simulator to mimic the operational equipment. In contrast, instructional features are those simulator capabilities that facilitate the instructional process. The evaluation of each class of features is discussed below.

<u>Fidelity Features</u>. The fidelity of devices was defined in terms of the two dimensions of the performance domain: conditions and actions. For the former dimension, the evaluation consisted of determining whether or not devices could simulate each condition within the parameters described in Chapter 2. The detailed results (presented in Appendix F) consist of a table of "YES" and "NO" entries corresponding to instances where the device either could or could not simulate a particular condition. Summaries of these ratings may be found in Figure 5-1 of Volume 1. Similarly, the extent to which every action identified in the domain could be performed on the devices was determined by answering some "YES/NO" questions. The questions were all phrased so that "NO" responses required comments whereas "YES" responses do The questions were addressed in the following order: (a) can the action be performed or practiced on device (if not, do not answer any more questions); (b) can every subcomponent (step) of the action be performed or practiced; (c) are stimuli/responses equivalent to those on operational equipment; and (d) should performance on the device be positively related to performance on the operational equipment? The responses to these questions and the detailed comments are found in Appendix G. Summaries of these ratings may be found in Figures 5-2 to 5-4 of Volume 1. Also, instances of potential negative transfer were singled out for discussion in the text (see Volume 1, Chapter 5).

<u>Instructional Features</u>. To determine the instructional features on the designated devices, we first composed a comprehensive list of these features that have been identified in the research literature. Appendix H summarizes this literature by describing each feature in terms of its function, its training purpose, and references to it in the research literature. The

appendix indicates the relative consensus in the citations to the features by listing them in order of the number of associated references. The features with more references are more general in function (i.e., less dependent on the nature of training), whereas features with fewer references were more idiosyncratic in nature (i.e., relevant to a particular training application). Using this inventory as a guide, 17 separate instructional features were identified over all 4 devices. Of that total, 12 instructional features were found implemented on U-COFT in comparison with 9 on TopGun, 7 on VIGS, and 4 on SIMNET. A summary of instructional features that are found on each device is provided in Table 5-1 of Volume 1 and the effectiveness of each is discussed in the text (see Volume 1, Chapter 5).

Evaluation of Devices with Respect to Testing Requirements

Ratings of device capabilities for testing performance in the tactical gunnery domain were made at two levels. First, a number of questions were directed at the individual elements of the gunnery domain. These included representation of the element, type of automatic recording that might be available for the element, and the possibility of scoring being done by an observer. An assumption underlying our testing concept is that performance and therefore tests of performance are organized around chunks of connected elements. Thus, a second set of evaluation questions were directed at the activities and options as organized in the tactical gunnery domain analysis. These included questions about the coverage and composite scoring for the domain segment being reviewed. Ratings for each device along with coding keys for the ratings are presented in Appendix I. These ratings are summarized in Figures 6-1 to 6-3 of Volume 1.

<u>List of Training and Testing Objectives Within Instructional Units</u>

The final product of the research was the assignment of devices and objectives to units of instruction. The hierarchical analysis of gunnery skills revealed 235 training and testing objectives, 144 of which were not duplicates of objectives presented elsewhere in the domain. Those 144 objectives were then assigned to 19 units of instruction. The prerequisite relationships between units of instruction are shown in Figure 7-1 of Volume 1. Appendix J provides a listing of the objectives within each of the units of instruction. As shown in the appendix, the instructional units are numbered from 1 to 19 to identify units as well as to provide a suggested order of presentation. The sequence was primarily determined by the prerequisite relationships in the diagram and a progressive elaboration strategy as described in chapter 4. However, practical constraints were also considered in sequencing instructional units. Finally, the appendix indicates where objectives were assigned to more than one unit of instruction. The intent of this iterative training strategy was to provide the student with multiple experiences on gunnery training objectives in an increasingly realistic context.

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APPENDIX A

DOMAIN OF ARMOR GUNNERY CREW BEHAVIORS

APPENDIX A DOMAIN OF ARMOR GUNNERY CREW BEHAVIORS

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	GHR	LDR	DYR
Enter TC station	Enter GMR's station	Erect crosswind sensor	Enter DVR's station
Power up CWS/turret	Operate domelight	Install LDR's mechinegun	Power up hull systems
Operate domelight	Operate Intercom	Enter LDR's station	Operate domelight
Operate intercom	Install coax	Operate domelight	Check turret seal
Adjust seat	Adjust seats/browpeds	Power up LDR's station	Operate intercom
Adjust hatch	Adjust chestrest	Operate intercom	Adjust seat/periscopes
Adjust platform	Power up GMR station	Adjust LOR's seat/platform	Adjust hatch
Install TC's weapon	Perform GPS function check	Adjust LDR's hatch	Adjust steer/throttle control
Adjust kneeguard	Adjust GPS	Install/check LDR's night vision	Operate drain valves
Adjust GPSE headrest/lens	Perform computer self-test	vlewer	Start engine
Operate manual range controls	Perform computer data check	Position LDR's guards for firing	Make after-start checks
Operate power control handle	Perform TIS check	Operate LDR's panel	
Operate CWS in power/manual	Perform GAS adjust	Operate turret traverse lock	
modes	Operate power control handles	Operate ready amounttion door in	
	Operate manual elevation/traverse	auto/manual modes	
	cranks	Operate semi-ready ammunition door	
	Perform lead system check	Operate hull amounttion door	
	Perform firing circuits check	Stow 105MM amounition	
	Perform crosswind sensor check	Operate main gun breechblock	
	Perform hydraulic pressure check	Check replenisher	
	Perform hydraulic pressure check	Check replenisher	

¹ Prepare for Operations (PREOPS) checks are performed with the aid of the Operator's Manual (TM 9-2350-10-2). These procedures are not necessarily performed in the stated order.

ACTIVITY 2. PERFORM PREPARE-TO-FIRE (PRE-FIRE)2 CHECKS

TC TC	GNR	LDR	DVR
Supervise/assist main gun boresight	Boresight mein gun	Clear/load coaxial machinegun	Check fuel tanks
		Fill ready rack	Report fuel status
Boresight TC's weapon	Zero coaxial machinegun	• Control Construction	
Zero TC's weapon	Report weapon status	Report ammo status	
zero ic s weapon	Acpoil Respon Status		
Select/announce battlecarry AMMO, RANGE	Index battlecarry ammo using AMMO SELECT switch	Load battlecarry ammo	
	Introduce battlesight range into CCP		
		•••••••••••••	
Option 2.1. Prepare for Offense			
Receive offensive mission/			
formation/movement/commo			
Analyze terrain			
Check map overlay			
Brief crew	Receive TC briefing	Receive TC briefing	Receive TC briefing
Control DVR, 1f necessary, to			Select routes in accordance with

mission and formation

maintain position in PLT

and concealment

formation and to exploit cover

²Boresighting is performed in accordance with procedures outlined in the Tank Gunnery Tables (FM 17-12-1).

Option 2.2. Prepare for Defense

тс	GNR	LOR	DYR
Issue driver commands to move with platoon to occupy battle position			Orive to bettle position
Receive defensive mission/position commo			
Prepare primary/alternate/ supplementary positions			Rehearse movement between primary and alternate firing positions
Analyze terrain	Inspect terrain through GPS/TIS	Inspect terrain to flank/rear	
Prepare tank sketch card	Check GAS clearance		Take primary firing position
indicatingTRPskey terrain featuressector boundariesindirect fire locations	Learn TRP locations/ranges		Honitor displays

ACTIVITY 3. ACQUIRE TARGET(S)

Part 3.1. Search for Target(s)

Option 3.1.1. Search Open Hatch--Day

	GNR	LDR	DVR
Receive instruction for sector air guard/ATGH guard	Select 3X GPS/TIS magnification		If moving, follow wingman concept/react to formation changes
Assign responsibility to loader	Search on gun exis using GPS	Perform air guard search (if	
Orient gun tube	Alternate using GPS with TIS (see Option 4.4: "Engage targets	assigned)	
Search left front clockwise to left rear	using TIS")	Search right front center clockwise to right rear	Search fender to fender
xecute search techniques:	Execute search techniques:	Execute search techniques:	Execute search techniques:
. rapid scan	. rapid scan	. rapid scan	. rapid scan
. slow scen	. slow scan	, slow scan	. slow scan
. detaile i search	. detailed scan	. detailed search	. detailed search
. flat terin air search . hilly terrain air search		. flat terrain air search . hill terrain air search	
, , , , , , , , , , , , , , , , , , , ,			
Option 3.1.2. Search Closed Hatch	Oay		
	Day Select 3X GPS/TIS magnification		If moving, follow wingman concept/react to formation
Search 360°			Committee of the commit
Search 360 ⁰	Select 3X GPS/TIS magnification	Search right front counter-	concept/react to formation
earch 360 ⁰	Select 3X GPS/TIS magnification Search on gun axis using GPS	Search right front counter- clockwise to right reer	concept/react to formation changes
earch 360 ⁰ erform air guard duties	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets		concept/react to formation changes
earch 360 ⁰ erform air guard duties	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS")	clockwise to right reer	concept/react to formation changes Search fender to fender
earch 360 ⁰ Perform air guard duties Execute search techniques:	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS") Execute search techniques:	clockwise to right reer Execute search techniques:	concept/react to formation changes Search fender to fender Execute search techniques:
earch 360 ⁰ erform air guard duties xecute search techniques: . Rapid scan	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS") Execute search techniques: . Repid scan	clockwise to right reer Execute search techniques: . Repid scen	concept/react to formation changes Search fender to fender Execute search techniques: . Rapid scan
Execute search techniques: Repid scan Slow scan Detailed search Flat terrain air search	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS") Execute search techniques: . Rapid scan . Slow scan . Detailed scan . Hear scan [Check with	Execute search techniques: . Rapid scan . Slow scan	concept/react to formation changes Search fender to fender Execute search techniques: . Rapid scan . Slow scan
Execute search techniques: Rapid scan Slow scan Detailed search	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS") Execute search techniques: . Rapid scan . Slow scan . Detailed scan	Execute search techniques: . Rapid scan . Slow scan . Detailed search	concept/react to formation changes Search fender to fender Execute search techniques: . Rapid scan . Slow scan
. Slow scan . Detailed search . Flat terrain air search	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS") Execute search techniques: . Rapid scan . Slow scan . Detailed scan . Hear scan [Check with	Execute search techniques: . Rapid scan . Slow scan . Detailed search . Flat terrain air search	concept/react to formation changes Search fender to fender Execute search techniques: . Rapid scan . Slow scan
Execute search techniques: Repid scan Slow scan Detailed search Flat terrain air search	Select 3X GPS/TIS magnification Search on gun axis using GPS Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS") Execute search techniques: . Rapid scan . Slow scan . Detailed scan . Hear scan [Check with	Execute search techniques: . Rapid scan . Slow scan . Detailed search . Flat terrain air search	concept/react to formation changes Search fender to fender Execute search techniques: . Rapid scan . Slow scan

Part 3.2. Detect/Locate/Identify Target(s)

TC	GMR	LDR	DVR			
Detect target(s)/signature(s)/ obstacle(s)	Detect target(s)/signature(s)/ obstacles	Detect target(s)/signature(s)/ obstacles	Detect target(s)/signature(s)/ obstacles			
Locate target(s) using one of the following methods: . traverse . optics . reference point	Locate target(s) using one of the following methods: . optics . reference point	Locate target(s) using one of the following methods: . clock . sector	Locate target(s) using one of the following methods: . clock . sector			
Identify target(s) making the following determinations: . IFFN . nomenclature	Identify target(s) making the following determinations: . IFFN . nomenclature	Identify target(s) making the following determinations: . IFFN . nomenclature	Identify target(s) making the following determinations: . IFFN . nomenclature			
Note number of targets Classify multiple targets as most dangerous, dangerous, or least dangerous	If target detected, announce GUNNER REPORT, <target>, <location></location></target>	If target detected, announce LOADER REPORT, <target>, <location></location></target>	If target detected, announce LOADER REPORT, <target>, <location></location></target>			
Confirm acquisition report	Confirm acquisition report		Evaluate cover and concealment			
Estimate range to select weapon(s) and to evaluate LRF return	Estimate range to evaluate LRF return					

Part 3.3. Evaluate Situation

TC GHR LDR Decide whether or not to engage contingent on the following factors: * platoon mission . platoon fire plan (fire pattern/firing technique) . platoon leader command Select the appropriate weapon/ ammunition and the firing mode (precision/degraded) contingent on the following factors: . Target range . Target type (hard/soft, point/area) . Tank status (ammo, malfunctions) Determine crewman (GNR, TC, LDR) and type of fire command (single, multiple, or simultaneous) contingent on the following factors: . Number of targets . Target classification

ACTIVITY 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN

Option 4.1. Engage single target from the offense using precision gunnery

TC	GNR	LOR	DVR
Issue contact report: CONTACT <direction> <target></target></direction>		Drop down into turret	Monitor TC and platoon leader commands
		Check turret ring	
Decide whether to engage target			
while moving or from a short		Set GUN/TURRET DRIVE switch in EL	
halt		UNCPL position	
If engaging from a short halt,			If TC announces HALT, stop
issue driver command: DRIVER		Case 4.1.A. Announced Round 1s Not	smoothly
STOP		Loaded	
			If TC does <u>not</u> announce HALT,
Relay any action drill command		Move ejection guard to SAFE	maintain steady platform
Issue fire command: GUNNER		Ensure SAFE light is lit	If antitank fire is encountered,
<ammo> <target></target></ammo>	Set/check switches:		seek cover and concealment or
	' FIRE CONTROL MODE: NORMAL	Open breech	execute action drill
Lay gun (simultaneous with fire	" LRF: ARM LAST RTN		
command)	· GPS: 3X	Remove incorrect round from	Alert crew of obstacles
	GUN SELECT: MAIN	chamber, 1f necessary	
	'AMMO SELECT as announced		
		Open ammo doors	
	Sight through GPS	Stow unwanted round, If necessary	
Release override	Grasp palm switches	Remove correct round from stowage	
Sight through GPSE	Announce IDENTIFIED	Load desired round	
	Switch GPS to 10X	[Continue with Case B:]	
	Lay on center mass of target		
	Begin to track moving target	Case 4.1.B. Announced Round 1s Loaded	
	Listen for driver alerts	Move ejection guard to FIRE	
	Depress lase button(s) with reticle on target	Clear recoil path	
Evaluate range display	Evaluate range display		
	Check ready-to-fire and fault symbols		
	Make control lay		

Option 4.1. Engage single target from the offense using precision gunnery (cont.)

TC	GHR	LOR	DVR
Listen for UP	Listen for UP	Announce UP	
Announce FIRE or FIRE, FIRE <alternate ammo=""></alternate>	Listen for FIRE		
	Announce ON THE WAY		
	Squeeze trigger(s) with reticle on target		
	Continue tracking	Open ammo doors	•••••

Option 4.2. Engage single target from the defense using precision gunnery

tc	GNR	LDR	DVR
Issue contact report: CONTACT <direction> <target></target></direction>		Drop down in turret	Set TACTICAL IDLE switch to ON
		Check turret ring	Set transmission control to D
Issue fire command: GUNNER <ammo></ammo>	Set/check switches:		
<target></target>	* FIRE CONTROL MODE: NORMAL * LRF: ARM LAST RTN	Ensure GUN/TURRET DRIVE switch in POWERED	Release parking brake
Walter Institute III and	· GPS: 3X		Depress/hold service brake
Announce DRIVER MOVE OUT, GUNNER	GUN SELECT: MAIN		
TAKE OVER	* AMMO SELECT as announced	Case 4.2.A. Announced Round 1s Not Loaded	Hove to hull defilade position
Lay gun (simultaneous with	Sight through GPS		
fire command)		Move ejection guard to SAFE	Set transmission control to R
Release override	Grasp palm switches	Ensure MAIN GUN STATUS light is	Depress/hold service brake
	Look through GAS to determine		
	when gun clears defilade	Open breech	
	Announce DRIVER STOP	Remove incorrect round from	
	000 0000000000	chamber, if necessary	
	Look through GPS		
Sight through GPSE	Announce IDENTIFIED	Open ammo doors	
Signit Caroliga Grac	WHINGING INCHAILAGE	Stow unwanted round, if necessary	
	Switch GPS to 10X		
		Remove correct round from stowage	
	Lay on center mass of target		
		Load desired round	**
	Track moving target		
		[Continue with Case B:]	
	Depress lase button(s) with		
	reticle on target	Consider the Constitution of Payand An	
Evaluate range display	Evaluate range display	Case 4.2.B. Announced Round 1s Loaded	
	Check ready-to-fire and fault	Move ejection guard to FIRE	
	symbols		
	Make control lay	Clear recoil path	

Option 4.2. Engage single target from the defense using precision gunnery (cont.)

TC	GMR	LDR	TC
Listen for UP	Listen for UP	Announce UP	
Announce FIRE or FIRE, FIRE <alternate anno=""></alternate>	Listen for FIRE		
	Announce ON THE WAY		
	Squeeze trigger(s)		
	Continue tracking	Open ammo doors	

TC

GNR

LDR

DVR

Case 4.3.A. GHR fails to identify
target(s)
Announces CANNOT IDENTIFY or does

not respond

Direct GMR onto target using one of the following techniques:

- . use verbal commands:
 - TRAVERSE <LEFT/RIGHT>,
- STEADY,
- ON
- . use TRP
- . ennounce MATCH MY TRACERS and use CAL .50 to point to target

OR

Announce FROM MY POSITION and proceed as a TC engagement (see Activity 10)

Case 4.3.B. GNR identifies
 incorrect target(s)
Announces IDENTIFY <DIFFERENT
TARGET>

If GMR is correct, issue a correction to the fire command

If GMR identifies wrong target, treat as Case 4.3.A and

<u>TC</u>	GHR	LDR	DVR
Engage targets using precision gunnery (Option 4.1 or 4.2)	Engage targets using precision gunnery (Option 4.1 or 4.2) with the following alternate switch settings: ' THERMAL MODE: ON . FLTR/CLEAR/SHTR: SHTR . THERMAL HAGNIFICATION: 3 TO 10X . POLARITY SWITCH: WHITE or BLACK HOT, as desired . SENSITIVITY/CONTRAST/FOCUS for best image	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)

ACTIVITY 5. ADJUST FIRE

TC	GHR	LOR	DVR
Recover sight picture	Recover sight picture	Set GUN/TURRET drive switch on EL UNCPL	
Observe strike of round	Observe/announce strike of every		
	round using one of the	Load announced round (Case A	
If TARGET was observed, determine	following terms:	Option 4.1)	
whether or not target was	. TARGET		
destroyed	. LOST	Move ejection guard to FIRE	
	. OVER		
	. SHORT	Clear recoil path	
	. DOUBTFUL		
		Announce UP	

Option 5.1. Use reengage technique

Announce REENGAGING

Release/reengage palm switches

Lay center of mass

Track moving target

Depress lase button(s) with reticle on target

Evaluate range

Evaluate range

Announce FIRE

Check ready-to-fire and fault

symbols

Announce ON THE WAY

Squeeze trigger(s) with reticle on

target

Continue tracking

TC

SNR

LDR

DVR

Observe/announce deflection and range error

Release/reengage palm switches

Adjust 1 mil in deflection

Adjust 200 meters in range

Begin to track moving target

Announce ON THE WAY

Squeeze trigger(s) with aiming point on target

Continue tracking

Option 5.3. Use TC adjustment

Issue subsequent fire command to adjust fire .5-3 mils in deflection and .5-2 mils in range (100-450m)

Release/reengage palm switches

Apply TC correction

Announce ON THE WAY

Squeeze trigger(s) with aiming point on target

Continue tracking

If target is destroyed or exposure is too long, command CEASE FIRE

If in defensive posture, command DRIVER, BACK UP

Return to defilade, or alternate position or seek alternate position

ACTIVITY 6. ENGAGE A SINGLE TARGET WITH THE COAX

TC	GNR	LDR	DVR
Issue fire command: GUNNER COAX <target></target>	Set/check switches: 'FIRE CONTROL HODE: NORMAL 'LRF ARM: ARM LST RTN 'GPS: 3X GUN SELECT: COAX	Set GUM/TURRET drive switch on POWERED	Heintain steady platform
Ley gun (simultaneous with fire command)			
Release override	Grasp palm switches		
	Announce IDENTIFIED		
	Switch GPS to 10%		
	Lay center of target		
	Depress lase button(s)		
Evaluate range display	Evaluate range display		
	Listen for FIRE		
Announce FIRE			
	Announce ON THE MAY		
Honitor/evaluate engagement	Fire 20-30 rounds (5-6 tracers) to destroy/suppress point/area targets	Monitor and correct ammo feed	
	Adjust fire as needed		
Command CEASE FIRE			

ACTIVITY 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN

TC	<u>GHR</u>	LDR	DVR
Issue fire command: GUNNER <ammo> <number> <targets>, <right left=""> <target> FIRST</target></right></targets></number></ammo>	Engage first target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Engage first target using precision gunnery (Option 4.1 or 4.2)			
If first target is not destroyed, adjust fire (Activity 5)	If first target is not destroyed, adjust fire (Activity 5)	If first target is not destroyed, perform LDR's actions as described in Activity 5	If first target is not destroyed, perform DVR's actions as described in Activity 5
If first target is destroyed, announce <next> TARGET</next>	Engage second target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
[Continue until all targets are destroyed]			,
Announce CEASE FIRE			

LDR DVR Option 8.1. Simultaneous targets Issue fire command: GUNNER <AMMO> Engage main gun target using Perform LDR's actions as described Perform DVR's actions as described <TARGET>, FIRE AND ADJUST precision gunnery (Option 4.1 in precision gunnery (Option in precision gunnery (Option or 4.2) 4.1 or 4.2) 4.1 or 4.2) Continue with Option 8.2 Adjust fire using standard adjustment as described in Option 5.2 If target is destroyed, announce TARGET -- CEASE FIRE Option 8.2. Cal .50 targets Announce: CALIBER .50 Charge TC's weapon Lay weapon for deflection Estimate range to target Lay CWS sight range line on target Aid in adjusting TC's weapon Adjust fire if needed If target is destroyed, announce

TC COMPLETE

ACTIVITY 9. ENGAGE TARGET(S) USING DEGRADED GUNNERY TECHNIQUES

Option 9.1. Engage target(s) using battlesight gunnery

TC	GHR	LDR	DVR
Issue fire command: GUNNER	Set/check switches:	Perform LDR's actions as described	Perform DVR's actions as described
BATTLESIGHT <target></target>	* FIRE CONTROL MODE: NORMAL	in precision gunnery (Option	in precision gunnery (Option
	' LRF: SAFE	4.1 or 4.2)	4.1 or 4.2)
Depress MANUAL RANGE BATTLE SGT	' GPS: 3X		
button	GUN SELECT: MAIN		
	* APMO SELECT: battlecarry ammo		
Estimate range to target			
If target is outside of ± 200m of			
battlesight range, enter range			
change using MAN RNG B/S			
ADD/DROP toggle switch			
Check range readout in GPSE			
Engage target using precision	Engage target using precision		
gunnery (Option 4.1 or 4.2) but	gunnery (Option 4.1 or 4.2) but		
without evaluating LRF display	without lasing to target		
••••••		••••••••••	

TC	GNR	LDR	DVR
If LRF fails to function or is rendered ineffective due to environmental conditions or battlefield obscurants, TC chooses of using one of the following techniques:		Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Case 9.2.A. Use battlesight gunnery			
Engage target using battlesight gunnery (Option 9.1)	Engage target using battlesight gunnery (Option 9.1)		
Case 9.2.8. TC indexes range			
Issue fire command: GUNNER <ammo> <target></target></ammo>	Engage target using precision gunrary (Option 4.1 or 4.2) but without lasing to target		
Estimate range to target	Announce IDENTIFIED		
Index range using MAN RNG 8/S ADD/DROP toggle switch			
Case 9.2.C. GHR indexes range			
Estimate range to target			
Issue fire command: GUNNER <ammo> INDEX <range></range></ammo>	Open CCP door		
	Press RANGE button		
	Enter <range></range>		
	Press ENTER button		
	Close CCP door		
	Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target		
Case 9.2.D. GMR manually applies range			
Engage target using GAS (Option 9.10)	Engage target using GAS (Option 9.10)		

Option 9.3. Engage target given multiple returns from LRF

TC	GNR	LDR	DVR
Estimate range to target	Depress lase button(s)	Perform LDR's actions as described in precision gunnery (Option	Perform DVR's actions as described in precision gunnery (Option
Evaluate range display	If multiple return symbol appears in GPS, announce RANGE <in METERS></in 	4.1 or 4.2)	4.1 or 4.2)
If range appears incorrect, may instruct GNR to switch LRF setting from ARH 1ST RTN to ARH LAST RTN or v.v.	Switch LRF setting in accordance with TC instructions		
If multiple return symbol appears in GPSE <u>and</u> displayed range is outside ± 200m, take either one of the following actions:			
Case 9.3.A. Gunner releses			
Announce RELASE	Relay on target		
	Depress lase button(s)		
Case 9.3.B. TC corrects range			
Correct range using MAN RNG 8/S ADD/DROP toggle switch			
If displayed range is within ± 200m of estimated range, announce FIRE	Squeeze trigger(s) with reticle on target		

Option 9.4. Engage target given no range display (loss of symbology)

TÇ	GNR	LOR	DVR
Case 9.4.A. Little or no time Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating range	Engage target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DYR's actions as described in precision gunnery (Option 4.1 or 4.2)
Case 9.4.8. Time permitting Have gunner report range from CCP	Open CCP door		
	Press RANGE button		
Evaluate range	Announce range		
Option 9.5. Engage target given cro	osswind sensor failure		
Option 9.5. Engage target given cro	osswind sensor failure		
Option 9.5. Engage target given cre If computer self-test indicates crosswind sensor failure, have the gunner cancel crosswind	Osswind sensor fellure Open CCP door Press CROSSWIND button	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
If computer self-test indicates crosswind sensor failure, have	Open CCP door	in precision gunnery (Option	in precision gunnery (Option
If computer self-test indicates crosswind sensor failure, have the gunner cancel crosswind	Open CCP door Press CROSSWIND button	in precision gunnery (Option	in precision gunnery (Option
If computer self-test indicates crosswind sensor failure, have the gunner cancel crosswind	Open CCP door Press CROSSWIND button Press "O" key	in precision gunnery (Option	in precision gunnery (Option

<u>TC</u>	GNR	LDR	DVR
If computer self-test indicates	Open CCP door	Per orm LDR's actions as described	Perform DVR's actions as described
cant sensor failure, have the GNR		in precision gunnery (Option	in precision gunnery (Option
cancel cant input	Press CANT button	4.1 or 4.2)	4.1 or 4.2)
	Press "0"		
	Press ENTER button		
	Close CCP door		
Announce DRIVER STOP			Move tank to level ground and
			stop tank
Engage target using precision	Engage target using precision		
gunnerystationary (Option 4.2	gunnerystationary (Option		
while monitoring GNR's cant	4.2)		
correction			
	If tank is not on level ground,		
	compensate by aiming 1 mil		
	high/1 mil opposite direction		
	of cant per 1000 meters in		
	range to target		
Cables G. T	ed angle sensor failure		
option y./. Engage target given le			
	Open CCP door	Perform LDR's actions as described	Perform DVR's actions as described
	Open CCP door	Perform LDR's actions as described in precision gunnery (Option	Perform DVR's actions as described in precision gunnery (Option
If computer self-test indicates	Open CCP door Press LEAD button	and the second of the second o	Perform DVR's actions as described in precision gunnery (Option 4.2)
If computer self-test indicates lead angle sensor failure, have		in precision gumnery (Option	in precision gunnery (Option
If computer self-test indicates lead angle sensor failure, have	Press LEAD button	in precision gumnery (Option	in precision gunnery (Option
If computer self-test indicates lead angle sensor failure, have	Press LEAD button Press "O" key	in precision gumnery (Option	in precision gunnery (Option
If computer self-test indicates lead angle sensor failure, have the GNR cancel lead angle input	Press LEAD button Press "0" key Press ENTER button	in precision gumnery (Option	in precision gunnery (Option
If computer self-test indicates lead angle sensor failure, have	Press LEAD button Press "0" key Press ENTER button	in precision gumnery (Option	in precision gunnery (Option 4.2)
If computer self-test indicates lead angle sensor failure, have the GNR cancel lead angle input Announce DRIVER STOP	Press LEAD button Press "0" key Press ENTER button Close CCP door	in precision gumnery (Option	in precision gunnery (Option 4.2)
If computer self-test indicates lead angle sensor failure, have the GMR cancel lead angle input Announce DRIVER STOP Engage target using precision	Press LEAD button Press "0" key Press ENTER button Close CCP door Engage target using precision	in precision gumnery (Option	in precision gunnery (Option 4.2)
If computer self-test indicates lead angle sensor failure, have the GMR cancel lead angle input Announce DRIVER STOP Engage target using precision gunnerystationary (Option	Press LEAD button Press "0" key Press ENTER button Close CCP door Engage target using precision gunnery (Option 4.2) but apply	in precision gumnery (Option	in precision gunnery (Option 4.2)
If computer self-test indicates lead angle sensor failure, have the GMR cancel lead angle input Announce DRIVER STOP Engage target using precision gunnerystationary (Option	Press LEAD button Press "O" key Press ENTER button Close CCP door Engage target using precision gunnery (Option 4.2) but apply lead to moving target as	in precision gumnery (Option	in precision gunnery (Option 4.2)

Option 9.8. Engage target given GPS failure (day channel)

TC	GNR	LOR	DVR
If no GPS image, have CNR switch to thermal channel and engage targets using TIS (Option 4.4)	Engage targets using TIS (Option 4.4)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DYR's actions as described in precision gunnery (Option 4.1 or 4.2)
		••••••	
Option 9.9. Engage target given G	PS/TIS failure		
If both GPS and TIS fail, the TC has the choice of using one of the following engagement techniques:		Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Case 9.9.A. Use GAS with precision techniques			
Engage target using GAS gunnery (Option 9.10)	Engage targets using GAS gunnery (Option 9.10)		
Case 9.9.B. Use GAS with battlesight techniques			
Engage target using battlesight gunnery (Option 9.1)	Engage target using battlesight gumnery (Option 9.1) but with the GAS instead of the GPS		

TC	GMR	LOR	OVR
Estimate range to target		Perform LDR's actions as described in precision gunnery (Option	Perform LDR's actions as described in precision gunnery (Option
Issue fire command: GUNNER <apmo> <target> <range></range></target></apmo>	Set/check switches: FIRE CONTROL MODE: NORMAL LRF: SAFE	4.1 or 4.2)	4.1 or 4.2)
Ley gun (simultaneous with fire commend)	* GUN SELECT: MAIN * AMMO SELECT: as announced		
	Sight through GAS		
Release override	Grasp palm switches		
	Announce IDENTIFIED		
	Lay announced range line on target		
	Begin tracking moving target		
	Apply lead to moving target		
Announce FIRE	Listen for FIRE		
	Announce ON THE MAY		
	Squeeze trigger(s) with reticle aiming point on target		
	Continue tracking		

Option 9.11. Engage target given stabilization system failure (in emergency mode)

TC	GNR	LDR	DVR
Issue fire command: GUNNER <ammo> <target></target></ammo>	Set/check switches: FIRE CONTROL MODE: EMERGENCY LRF: ARM LAST RTN GPS: 3X GUN SELECT: MAIN AMMO SELECT: as announced	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Announce CRIVER STOP	Sight through GPS		Stop smoothly
Lay gun (simultaneous with fire command)			
Release override	Grasp palm switches		
	Announce IDENTIFIED		
	Begin tracking moving target		
	Apply lead to moving target		
Announce FIRE	Listen for FIRE		
	Announce ON THE WAY		
	Squeeze trigger(s) with reticle aiming point on target		
Announce DRIVER, MOVE OUT	Continue tracking		Resume driving
•••••		•••••	

<u>TC</u>	GHR	LDR	DYR
Announce DRIVER STOP	Set/check switches. • FIRE CONTROL MODE: MANUAL	Perform LDR's actions as described in precision gunnery (Option	Stop smoothly
Issue fire command: GUNNER <ammo></ammo>	' GPS: 3X	4.1 or 4.2)	
<target> <direction> <range></range></direction></target>	GUN SELECT: MAIN		Perform DVR's actions as described
	' AMMO SELECT: as announced		in precision gunnery (Option 4.1
			or 4.2)
	Sight through GAS		
	Traverse/elevate gun with menual controls		
	Announce IDENTIFIED		
	Lay announced range line on target		
	Begin tracking moving target		
	Apply lead to moving target		
Announce FIRE	Listen for FIRE		
	Announce ON THE WAY		
	Press elevation knob firing		
	trigger with reticle aiming		
	point on target		
•	If gun fails to fire, vigorously		
	turn blasting machine handle 3-		
	4 times		
Announce DRIVER MOVE OUT			Resume driving

1c	GNR	LOR	DVR
Issue one of the following fire commands:		Performs LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Performs DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Case 10.A. Gunner cannot identify target: FROM MY POSITION	Set/check switches: 'FIRE CONTROL MODE: NORMAL . TIS: STBY/ON 'LRF: ARM LAST RTN 'GPS: 10X 'GUN SELECT: MAIN 'AMMO SELECT: as announced	(option 4.2 of 4.2)	(option 4.2 of 4.2)
Case 10.8. Three-man crew (no GNR)			
Announce LOAD <appio></appio>			
Estimate range to target			
Sight through GPSE			
Lay on center mass of target			
Depress lase button			
valuate range display			
fake control lay			
Announce ON THE MAY			
Squeeze trigger			
Announce CEASE FIRE			

 $^{^{\}rm 3}{\rm In}$ three-man crew arrangement, TC performs GMR actions as well as his own.

ACTIVITY 11. ASSESS RESULTS OF ENGAGEMENT

GNR	LDR	DVR
Check/adjust HRS	Check replenisher reservoir	
	Remove spent casings	
		Respond to TC driving commends
		Respond to TC driving commands
Index battlecarry ammo		
Announce <ammo> INDEXED</ammo>	Load announced round as described	
	in precision gunnery (Option	
	4.1 or 4.2)	
	Announce loading status	
	Check/adjust HRS	Check/adjust MRS Check replentsher reservoir Remove spent casings Index battlecarry ammo Announce <ammo> INDEXED Load announced round as described in precision gunnery (Option 4.1 or 4.2)</ammo>

APPENDIX B RESULTS FROM DOES 19K SURVEY

APPENDIX B RESULTS FROM DOES 19K SURVEY

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Table B-1

Frequency, Performance, and Predicted Performance of M1 Tasks
Listed in Rank Order for each Variable

		Frequency		rformance	<u>Pre</u>	<u>Predicted Performancea</u>		
Rank Order	Task	Mean Frequency ^b	Task	Mean Performance ^C	Task	Estimate	Residual ^d	
1	48	1.545	48	2.444	18	3.403	-0.546	
2 3 4 5 6 7	68	1.652	3	2.450	3	2.880	-0.430	
3	*25*	1.739	68	2.556	2	3.113	-0.385	
4	10	1.773	8	2.714	17	3.447	-0.356	
5	3	1.783	2	2.727	1	3.214	-0.351	
6	4	1.783	4	2.762	66	3.154	-0.336	
7	*23*	1.913	66	2.818	8	3.047	-0.333	
8	33	2.000	10	2.842	54	3.489	-0.298	
9	*51*	2.045	18	2.857	19	3.556	-0.295	
10	8	2.087	_1	2.864	48	2.737	-0.293	
11	37	2.174	33	2.905	53	3.433	-0.283	
12	*57*	2.190	56	2.944	*65*	3.363	-0.252	
13	*22*	2.217	*64*	2.955	68	2.803	-0.248	
14	2	2.217	17	3.091	*64*	3.195	-0.240	
15	66	2.304	*57*	3.111	56	3.161	-0.216	
16	62	2.304	*65*	3.111	15	3.372	-0.191	
17	56	2.318	53	3.150	9	3.335	-0.145	
18	*47*	2.318	*25*	3.158	38	3.556	-0.121	
19	*64*	2.391	15	3.182	*31*	3.640	-0.119	
20	61	2.391	9	3.190	4	2.880	-0.118	
21	6	2.391	54	3.190	16	3.340	-0.113	
22	*27*	2.409	36	3.227	33	3.001	-0.097	
23	1	2.435	16	3.227	*42*	3.447	-0.083	
24	59	2.455	67	3.227	46	3.366	-0.081	
25	*24*	2.478	19	3.261	67	3.306	-0.079	
26	36	2.591	46	3.286	41	3.680	-0.071	
27	13	2.609	12	3.364	7	3.474	-0.065	
29	67	2.652	*24*	3.364	36	3.281	-0.054	
30	32	2.696	*42*	3.364	50	3.462	-0.041	
31	9	2.727	*51*	3.368	10	2.875	-0.033	
32	16	2.739	7	3.409	40	3.676	-0.024	

(table continues)

	Fr	equency	Per	rformance	Pre	dicted Per	formancea
Rank Order	Tack	Mean Frequency ^b	Tack	Mean Performance ^C	Tack	Estimate	Residual ^d
Ol del	Idak		Idak	rei i Oi mailce	IUSK	Latinate	Nesidual
33	*65*	2.800	50	3.421	*43*	3.447	-0.018
34	46	2.810	*23*	3.421	12	3.370	-0.006
35	12	2.818	*22*	3.429	28	3.447	0.008
36	15	2.826	*43*	3.429	*57*	3.099	0.012
37	18	2.913	38	3.435	11	3.418	0.017
38	14	2.913	11	3.435	60	3.462	0.038
39	*49*	2.952	59	3.444	*30*	3.694	0.045
28	*52*	2.619	13	3.364	29	3.585	-0.064
40	11	2.957	14	3.455	45	3.619	0.048
41	*26*	2.957	28	3.455	14	3.403	0.051
42	53	3.000	*52*	3.474	39	3.683	0.056
43	55	3.000	37	3.476	13	3.288	0.075
44	28	3.043	61	3.478	21	3.523	0.086
45	*42*	3.043	60	3.500	35	3.683	0.090
46	63	3.043	*31*	3.522	55	3.433	0.091
47	17	3.043	29	3.522	*44*	3.511	0.108
48	*43*	3.043	55	3.524	20	3.534	0.118
49	60	3.091	32	3.524	*24*	3.233	0.130
50	50	3.091	6	3.545	*49*	3.417	0.139
51	7	3.130	62	3.550	63	3.447	0.153
52	54	3.182	*49*	3.556	34	3.672	0.154
53	58	3.227	*47*	3.600	*52*	3.293	0.181
54	*44*	3.261	63	3.600	32	3.323	0.201
55	21	3.304	41	3.609	_5	3.581	0.202
56	20	3.348	21	3.609	59	3.223	0.222
57	19	3.435	*27*	3.619	58	3.502	0.225
58	38	3.435	*44*	3.619	*26*	3.418	0.234
59	5	3.545	40	3.652	61	3.195	0.284
60	29	3.565	*26*	3.652	*25*	2.855	0.303
61	45	3.739	20	3.652	*22*	3.113	0.316
62	*31*	3.870	45	3.667	*51*	3.025	0.343
63	34	4.130	58	3.727	6	3.195	0.351
64	40	4.174	*30*	3.739	37	3.091	0.385

(table continues)

	<u>Fr</u>	Frequency		Performance		Predicted Performancea		
Rank Order	Task	Mean Frequency ^b	Task	Mean Performance ^C	Task	Estimate	Residual ^d	
65	41	4.217	39	3.739	62	3.154	0.396	
66	39	4.261	35	3.773	*27*	3.203	0.416	
67	35	4.261	5	3.783	*47*	3.161	0.439	
68	*30*	4.522	34	3.826	*23*	2.954	0.467	

Notes. Task means are based on 23 supervisor's ratings of 11 drivers, 8 loaders, 2 gunners and 2 "others," all "recent" OSUT graduates. Task titles are identified in the following table. Asterisks surround tasks which are contained in the gunnery analysis.

^aTask mean performance estimated with a curvilinear function of task frequency. Multiple R is .72, with curve component significant at $\underline{p} < .05$.

bOrdered from low to high frequency.

^COrdered from low to high performance.

dOrdered from performance below that expected based on frequency to performance above that expected based on frequency.

List of 19K OSUT Tasks

Task Number Task Title

- PERFORM OPERATOR'S MAINT ON AN MIGAL RIFLE, MAGAZINE AND AMMO
- 2. LOAD, REDUCE A STOPPAGE AND CLEAR AN M16A1 RIFLE
- 3. BATTLESIGHT ZERO AN M16A1 RIFLE
- 4. ENGAGE TARGETS WITH AN M16A1 RIFLE
- 5. PERFORM OPERATOR MAINT ON A CAL 45 PISTOL
- 6. ENGAGE TARGETS WITH A CAL 45 PISTOL
- 7. SET HEADSPACE AND TIMING ON A CAL .50 MG
- 8. ESTIMATE RANGE
- 9. COMMUNICATE USING VISUAL SIGNALLING TECHNIQUES
- 10. CONSTRUCT INDIVIDUAL FIGHTING POSITIONS
- 11. IDENTIFY TERRAIN FEATURES ON A MAP
- 12. DETERMINE THE GRID COORDINATES ON A MILITARY MAP
- 13. MEASURE DISTANCE ON A MAP
- 14. USE CHALLENGE AND PASSWORD
- 15. SEND A RADIO MESSAGE
- 16. MOUNT RADIO SET AN/VRC-64 OR 53 OR AN/GRC-160 OR 12s
- 17. PREPARE/OPERATE FM RADIO SETS
- PERFORM PMCS ON AN/VRC-64 OR 53 OR AN/GRC-160 OR 125 18.
- 19. OPERATE INTERCOMMUNICATION SET AN/VIC-1 IN AN M1 TANK
- INSTALL/REMOVE THE M240 COAX MG ON AN M1 TANK 20.
- 21. PERFORM OPERATOR MAINT ON AN M240/240C MACHINEGUN
- ZERO THE M240 COAX MG ON AN M1/M1A1 TANK 22.
- ENGAGE TARGETS WITH THE M240 COAX MG FROM THE GUNNER STATION ON AN 23. M1/M1A1 TANK
- 24.
- CLEAR AN M240 COAX TO PREVENT ACCIDENTAL DISCHARGE ON AN MI/M1A1 TANK ENGAGE TARGETS WITH THE M240 MG FROM THE LOADER'S STATION ON AN M1/M1A1 TANK
- INSTALL/REMOVE THE M240 LOADER'S MG ON AN M1/M1A1 TANK
- INSPECT AMMO AND PREP FOR STOWING
- MAINTAIN OPERATOR'S PART OF EQUIPMENT RECORD HOLDER 28.
- PERFORM PREVENTIVE MAINT ON BASIC ISSUE ITEMS
- START/STOP THE ENGINE ON AN M1/M1A1 TANK 30.
- DRIVE AN M1/M1A1 TANK 31.
- SLAVE START AN M1/M1A1 TANK 32.
- 33. PERFORM FUEL TRANSFER PROCEDURES ON AN M1/M1A1 TANK
- PREPARE DRIVER STATION FOR OPERATION ON AN MI/MIA1 TANK 34.
- 35. SECURE DRIVER STATION ON AN M1/M1A1 TANK
- OPERATE THE AV/VVS-2 NIGHT VISION VIEWER IN DRIVER'S HATCH ON AN M1/M1A1 TANK

(table continues)

- 37. REMOVE/INSTAL! TRACK BLOCKS ON AN M1/M1A1 TANK
- 38. TROUBLESHOOT THE M1/M1A1 TANK USING DRIVER'S CONTROL PANEL WARNING/CAUTION LIGHTS
- 39. PERFORM BEFORE OPERATION CHECKS AND SERVICES ON AN M1/M1A1 TANK
- 40. PERFORM DURING OPERATION CHECKS AND SERVICES ON AN M1/M1A1 TANK
- 41. PERFORM AFTER OPERATION CHECKS AND SERVICES ON AN MI/MIA1 TANK
- 42. PERFORM GUNNER'S/LOADER'S PREVENTIVE MAINT PREPARE-TO-FIRE CHECKS/ SERVICES ON AN M1/M1A1 TANK
- 43. PERFORM GUNNER'S/LOADER'S PREVENTIVE MAINT AFTER FIRING CHECKS/SERVICES ON AN M1/M1A1 TANK
- 44. PREPARE LOADER'S STATION FOR OPERATION ON AN MI/MIAI TANK
- 45. SECURE LOADER'S STATION ON AN M1/M1A1 TANK
- 46. PERFORM OPERATOR MAINT ON THE 105-MM BREECHBLOCK ASSEMBLY ON AN M1 TANK
- 47. LOAD/UNLOAD THE 105-MM MAIN GUN ON AN M1 TANK
- 48. LOAD/UNLOAD AN M250 GRENADE LAUNCHER ON AN M1/M1A1 TANK
- 49. PREPARE GUNNER'S STATION FOR OPERATION ON AN M1/M1A1 TANK
- 50. SECURE GUNNER'S STATION ON AN M1/M1A1 TANK
- 51. ENGAGE TARGETS WITH THE MAIN GUN FROM THE GUNNER'S STATION ON AN M1/M1A1 TANK
- 52. STOW AMMUNITION ON AN MI/MIAI TANK
- 53. PREPARE GUNNER'S/LOADER'S WEAPONS FOR TRAVEL ON AN M1/M1A1 TANK
- 54. SERVICE THE PRECLEANER ON AN M1/M1A1 TANK
- 55. CLEAN/SERVICE THE 105-MM MAIN GUN ON AN M1 TANK
- 56. OPERATE THE GPFU ON AN M1 TANK
- 57. BORESIGHT/SYSTEM CALIBRATE AN M1/M1A1 TANK
- 58. REFUEL AN M1/M1A1 TANK
- 59. UNLOCK STUCK PARKING BRAKE ON AN M1 TANK
- 60. SERVICE THE AIR INDUCTION SYSTEM ON AN M1 TANK
- 61. PREPARE AN M1 TANK FOR POWERPACK REMOVAL
- 62. CLEAR A CAL .50 M2 HB MG TO PREVENT ACCIDENTAL DISCHARGE
- 63. MAINTAIN A CAL .50 M2 HB MG ON AN M1/M1A1 TANK
- 64. VISUALLY IDENTIFY THREAT AIRCRAFT
- 65. RECOGNIZE/IDENTIFY FRIENDLY AND THREAT ARMORED VEHICLES
- 66. CAMOUFLAGE EQUIPMENT
- 67. CAMOUFLAGE YOUR DEFENSIVE POSITION
- 68. LOAD/UNLOAD AND CLEAR AN M203 GRENADE LAUNCHER

Table B-3
Descriptive Statistics for 68 19K OSUT Tasks

	Mean	S.D.	Minimum	Maximum				
Frequency	2.82	0.69	1.54	4.52				
Importance	3.83	0.33	2.68	4.39				
Performance	3.32	0.33	2.44	3.83				

APPENDIX C

REVIEW OF RESEARCH RELATED TO GUNNERY SKILL AND KNOWLEDGE COMPONENTS

APPENDIX C REVIEW OF RESEARCH RELATED TO GUNNERY SKILL AND KNOWLEDGE COMPONENTS

ONTENTS	_
Pa	ge
ARGET ACQUISITION	3
Crew Search	3 5 6
ANGE DETERMINATION	8
NOWLEDGE OF THE FIRE CONTROL SYSTEM	8
IRING THE INITIAL ROUND	9
Sight Picture/Stationary Engagements	
IRING SUBSEQUENT ROUNDS	13
Observation	
NOWLEDGE OF ARMOR PROCEDURES	15
EFERENCES	17

REVIEW OF RESEARCH RELATED TO GUNNERY SKILL AND KNOWLEDGE COMPONENTS

As stated in the text of the report, we examined the literature on generally acknowledge skill and knowledge components of armor gunnery. For each component, we attempted to answer the following questions: (a) Is there evidence for any relatioship between the skill/knowledge and gunnery performance, and (b) is the skill/knowledge trainable? The literature on each component is discussed separately below.

Target Acquisition

According to FM 1/-12-1, target acquisition can be broken down into six steps: crew search, detection, location, identification, classification, and confirmation. However, the middle three steps (detection, location, and identification), which define the three phases of target acquisition, are the core concepts in target acquisition. In fact, FM 17-12-1 defines target acquisition as "...the timely detection, location, and identification of targets in sufficient detail to permit accurate attack by either direct fire or supporting weapons" (p. 2-2).

Crew Search

Crew search refers to the collective efforts of a tank crew to systematically search the assigned areas of observation in order to acquire targets. In addition to perceptual skill required by this component, crewmembers must also know the sectors of observation along with specific ground and air search techniques. There is no research that relates these search skills and knowledges to gunnery performance; nor is there research on the trainability of these hypothesized components of gunnery proficiency.

Detection

Detection is the first of the three phases of target acquisition and is defined as "...the discovery, by any means available (sight, sound, smell), of any phenomena (personnel, equipment, objects) of potential military significance" (FM 17-12-1, p. 2-2). Detection occurs as a direct result of observing a target signature, which is an observable indicator of the presence of a potential target. Examples of target signatures include soldier footprints and the loud dull report indicating artillery.

Campbell and Black (1982) investigated the relationship between job sample performance and performance in training for a sample of soldiers in Basic Armor Training (BAT). Job sample testing was accomplished during the days prior to the start of training. Among the five job sample tests was one in which the soldiers were required to search a slide presentation using simulated gunner controls and sights in order to locate a partially hidden

target. Job sample performance was measured in terms time to locate the target and whether or not the subject located the target (laid reticle "at or near" target). Thus, the emphasis on this job sample was on correct detection of the target rather than the precision of the lay. The target location times were significantly correlated with student rankings as provided by instructors. The correlation was negative, as expected, indicating that higher ranks were associated with lower target detection times. However, target detection was not related to the other proficiency criteria: performance on mid- and end-of-cycle tests and main gun firing on Table VII.

Biers and Sauer (1982) similarly tested experienced tank commanders and gunners on a microcomputer-based job sample that measured some aspects of the target detection skill. As in the previously described job sample, potential targets were presented on photographic slides. Subjects began their search under simulated 3X magnification. They indicated target location by manipulating a joystick under microcomputer control to lay a simulated reticle on the target. The job sample procedure then called for subjects to switch to 10X magnification and relay the reticle. Once the reticle was centered on the target, the subject pressed a button labeled LASER. If invalid range data appeared as a result, the procedure called for the subject to press the laser a second time. If, however, valid range data were obtained, the subjects were to press another button labeled FIRE. Performance measures included distance from reticle to target (accuracy) and time to press 10X, LASER, and/or FIRE buttons (speed). The accuracy of procedures was also scored, but these measures are not relevant to target detection. These measures were correlated with self-reports of success at annual gunnery qualifications. Although the relationships were generally in the expected direction (i.e., good job sample performance associated with good gunnery scores), none of the relationships was statistically significant.

Black and Mitchell (1986) extended the work of Biers and Sauer by testing gunners on two job samples related to target detection. One job sample was the microcomputer-based job sample described above. The other was an analogous detection-like hands-on task using the M1 tank and an M55 laser boresighted with the main gun. Target scenes were presented by projector on a screen and viewed through the M1 sights. As above, speed and accuracy measures were recorded although the speed measures are the more relevant to target detection. Their results indicated that the hands-on and the computerized task were correlated with one another indicating that they tapped similar skills. However, there were no correlations between performance on either job sample and supervisor ratings of gunner performance. Black and Mitchell also examined records of actual (not recalled) performance of gunners on on their most recent Table VIII. They found that a positive relationship between speed on the hands-on job sample and percent hits in the night portion of Table VIII, which approached significance at the .05 level. There were no other significant relationships between gunnery scores and either job sample.

Over a series of eight experiments, Wolff and colleagues studied target detection training. In the first study, Stark, Wolff, and Haggard (1961) examined performance before and after classroom training using slides and movies. Their results showed that a reliable increase in performance between the two testings. Furthermore, comparison of posttraining performance between

a group receiving the pretest and one not receiving a pretest indicated no differences. The lack of differences indicated that the increase in performance could not entirely be due to the effects of repeated testing. A later study (Wolff & Van Loo, 1962) compared performance of subjects who were trained under different response conditions. Their results indicated that active responding by students using a response box to indicate the location of detected targets 25 percent over comparable conditions. Finally, the last study in the series (Wolff, Burnstein, Haggard, & Van Loo, 1962) indicated similar differences using a field test criterion. The field test stimuli consisted of actual stationary military targets at distances of 200 to 1500 yards. Students were instructed to detect and identify targets during the 60 secs allotted for each of the 21 presentations. Three training conditions were compared: classroom training with active participation, classroom without active participation, and a no training condtrol. Results indicated that classroom training with active participation produced superior detection performance.

Kottas and Bessemer (1983) also showed increases in target detection over trials for BAT students viewing targets through simulated optical and thermal sights. Their results indicated that alternating between optical and thermal sights produced better performance than either optical alone and thermal alone. However, the increase in accuracy associated with the alternating strategy occurs at the expense of an increase in time to detect. The fastest time occurred when using the optical sights alone. Performance using the thermal sights was initially poor but improved over time. An obvious question from this research is whether or not good gunners use an alternating optical/thermal strategy to detect targets in more realistic conditions. This question has not been addressed thusfar.

In conclusion, the research on target detection was mixed: One study showed a relationship to subjective ratings of performance in training; another showed some evidence of a relationship to actual gunnery performance. However, other studies failed to find those same relationships. On the other hand, there is rather convincing evidence that target detection is a trainable skill.

Location

Location, the second phase of target acquisition, refers to the determination of where the target is on the battlefield. Location is usually indicated by the tank commander using his controls to orient the gun in the general location of the target. The gunner then makes a final and more precise lay of the reticle on the target. In addition, FM 17-12-1 describes other methods for locating targets: clock, sector, traverse, reference point, and grid methods. No research has been performed to assess the relationship between the skills and knowledges related to locating targets and gunnery performance.

Identification

Identification refers to the to the process of identifying a potential target as a particular object. Target identification is sometimes distinguished from target recognition. Recognition refers to placing the perceived target into some class of objects, e.g., threat vs. friendly vehicles; whereas identification is the more specific process of naming the object, e.g., T72 or M113.

Olson, Goss, and Voiers (1958) examined the detection and identification of either a M48 tank or 2 1/2 ton truck. Among the more interesting findings was that the ranges at which the soldiers detected targets and identified targets were virtually identical. The authors cautioned that this may not be true with a larger sample of vehicles with which the soldiers were less familiar. Subjects were tested in groups of 10. The difference between the range at which the first observer detected/identified test vehicles and the range at which the fifth (median) observer identified the vehicle was about 200 yards. This finding indicates considerable individual differences on this target identification skills.

Graham (1986) examined the relationship between target identification and gunnery proficiency using the Unit Conduct of Fire Trainer (U-COFT). Target identification was defined as the time from when a target first appears to when the gunner announces "identified." Thus, as in the previous study, identification was confounded with the detection process. Three criteria of gunnery proficiency were measured: hit rate, reticle aim score, and opening time. Opening time is a speed measure of gunnery performance and is defined as the time from target appearance to firing the first round. Not surprisingly, target identification time was positively related to opening time, since opening time is contaminated with the time required to identify the target. Reticle aim scores are composite measures computed from opening time, time to kill, and reticle aim error. Identification time was positively related to this composite measure, which again was contaminated with predictor variance. In contrast, the third criterion (hit rate) was not contaminated with identification time. However, the results indicated that identification time and hit rate were not related.

Warnick, Chaistain, and Ton (1979) demonstrated that recognition and identification skills can be trained. Their subjects were Army helicopter pilots who were tested on those skills by viewing model vehicles through COBRA/TOW weapons sights. All subjects were initially pretested on recognition and identification without receiving feedback on their responses. They were then trained on the skills, which essentially consisted of practice on recognizing and identifying the model vehicles with feedback until they reached a perfo. The ce criterion of two consecutive perfect trials. They were then posttested on the vehicles, again without feedback. The results indicated substantial gains in recognition and identification performance.

To summarize, there is some evidence that the speed of target identification may be related to speed measures of gunnery proficiency;

however, the interpretation of this effect is compromised by problems in criterion contamination. On the other hand, there is rather good evidence that target identification is trainable.

Classification

The tank commander estimates the danger of potential targets by classifying each as either most dangerous, dangerous, or least dangerous. Most dangerous targets are targets with armor-defeating capabilities that appear to be readying to engage the tank. Dangerous targets are also targets with armor-defeating capabilities but do not appear to be presently engaging the tank. Least dangerous targets are those without armor-defeating weapon system but can report the tank to a threat vehicle that has such capabilities. These estimates are then used to determine engagement priorities.

Biers and Sauer (1982) tested tank commanders and gunners on their abilities to classify targets by presenting them slides of three threat vehicles. They were asked to identify the most dangerous vehicle by depressing a button corresponding to the vehicle. Both speed and accuracy measures were obtained from this job sample. These measures were correlated with past success in gunnery qualification. The experimenters obtained the expected positive correlations between speed of decision making and gunnery qualification scores. The results were opposite from expectations: performance on the classification job sample were negatively correlated with gunnery scores. However, neither of these relationships was significant. The experimenters speculated that the negative relationship may be due to the fact that gunnery engagement strategies may run counter to doctrine on threat classification. For instance, the more successful crews may open fire on any reasonable target rather than wasting time on this decision.

To test the trainability of the decision making skills, Biers and Sauer compared the performance of tank commanders and gunners. Presumably tank commanders have had more experience making this judgment and should perform better. The results did not confirm this expectation: tank commander and gunner performances were essentially equal. This finding was used to support the previous contention that tank commanders who are successful on Table VIII do not bother to classify targets. That is, the failure to find differences between groups may not indicate that the skill is untrainable; rather, that it is irrelevant to gunnery performance as defined by Table VIII.

Thus, the research literature failed to indicate a relationship between target classification and gunnery proficiency, nor was there evidence of systematic increases in target classification skill as a function of experience.

Range Determination

The laser range finder in the M1 tank is used to rapidly and accurately determine the range to a target. Consequently, tank gunnery performance on the M1 is not as dependent on the tank commander's range determination skills as it might be for less sophisticated tanks. Nevertheless, there are situations in which range determination skills are important to M1 gunnery. For instance, the tank commander uses his own estimates of range to verify returns from the laser range finder. In addition, range determination becomes crucial if the laser range finder becomes inoperable.

Kress (1981) correlated performance of tank commanders on a range estimation job sample and M60Al gunnery performance on Table VIII. The range estimation job sample required tank commanders to estimate the range to full scale target panels under both aided with the M60Al coincidence range finder and unaided with the range finder. Accuracy of job sample performance was within standards of +/- 3% error for aided range estimations and +/- 20% error for unaided estimations. However, neither aided nor unaided range estimation performance was significantly related to Table VIII performance.

It is not even clear whether or not range estimation is a trainable skill. Stark, Wolff, and Haggard (1961) measured the accuracy of range estimations both before and after receiving a range estimation training program. Because the data were skewed by extreme scores, nonparametric tests were used to test the significant between groups. The analyses indicated no differences in median accuracy; however, there was a reliable decrease in the range of scores as a function of training.

In summary, then, the literature did not indicate that skill in ranging is related to gunnery performance. There was also no evidence that range estimation is a trainable skill.

Knowledge of the Fire Control System

This category refers to crucial gunner and tank commander knowledges concerning the operation and capabilities of the fire control system. These knowledges form the basis of gunnery decision making that "...directly impacts on target engagement outcomes—both in terms of target destruction and crew survival" (Kraemer, 1984, p. 4). Because of the complexity of these knowledges and their obvious combat criticality, ARI developed training materials to sustain and enrich these knowledges for the M1 tank (Silbernagel, Vaughan, & Schaefer, 1982) and for the M60A3 (Kraemer, 1984). The training materials for the M1 and M60A3 are similarly organized around the following topics and subtopics:

. Fire Commands

- Overview of Fire Commands

- Classifying Threats

- Ammunition/Weapon Selection
- Fire Command Elements and Sequence

- Single Target Engagements

- Multiple/simultaneous Target Engagements
- . Degraded Mode Gunnery

- M1 Gunnery Systems

- Non-immediate Engagements
- Immediate Engagements
- . Multiple Returns

Excluding threat classification, which was previously discussed, there is no research that relates tank commander or gunner knowledge of the fire control system and gunnery performance. There is, however, some research on the trainability of these knowledges. Silbernagel et al. (1982) showed significant gains in performance from pre- to posttests on M1 fire control system knowledges as a result of working through each of the knowledge booklets. In contrast, Kraemer (1984) failed to show similar performance gains on the M60A3 knowledge booklets. The crucial difference between the two studies appears to be that Kraemer (1984) permitted soldiers to study the booklets on their own time. As a result, according to post-experimental questionnaire responses, most of the soldiers who were issued booklets failed to complete both knowledge and scenario portions of the booklets.

Firing the Initial Round

Firing an initial round at a target requires two distinct skill/knowledge components. The first component is the knowledge of the appropriate sight picture. "Sight picture" refers to the relationship between reticle and target. The second component is the psychomotor skill involved in operating the gunner or tank commander control handles so that the appropriate sight picture is achieved. This skill is commonly referred to as "tracking." The following discussion is organized according to these two components.

Some of the following research examines the relationship between gunnery proficiency and performance on a job sample that simulates either stationary or moving engagements. Although both knowledge of sight picture and tracking skill are necessary for both moving and stationary engagements, their relative criticality differs between these two types of engagements. For stationary engagements, knowledge of the sight picture predominates with tracking skill being relatively inconsequential. Consequently, stationary job samples that involve simulation of stationary engagements are discussed below under knowledge of sight picture. For moving engagements, tracking skill becomes more important. Thus, moving engagements are discussed under the latter topic.

Sight Picture/Stationary Engagements

Kress (1981) examined the relationship between gunners' knowledge of appropriate sight pictures and their performance on Table VIII. Gunners were tested by having them demonstrate the appropriate reticle/target relation by positioning a the reticle, drawn on a clear plastic overlay, on top of line drawing of a target. The engagement conditions were defined by a fire command that was printed on the target background. The percent correct on this job sample was computed for each subject and correlated with six measures of Table VIII gunnery performance. None of the correlations were significant.

Eaton (1978) tested the ability of the gunner to initially lay on a stationary target using the Willey Burst-on-Target (BOT) trainer. His results indicated that faster BOT times were significantly associated with a greater number of successful Table VIII battlesight engagements. However, BOT performance was not related to the speed of Table VIII battlesight engagements. Further, BOT performance was not related to Table V (subcaliber) performance.

Eaton, Johnson, and Black (1980) measured the relationship between a "center-of-mass" job sample and gunnery performance on a modified Table VI. In the job sample, the reticle of the Willey BOT trainer is placed in the middle of four tank silhouettes. At a signal, the subject was told to manipulate the control handles such that the reticle was laid on the center of mass one of the four targets. Both speed and accuracy measures were taken. Two groups of BAT students received job samples either before the start of training or after eight weeks of training. Comparisons of the two groups showed that BAT students made significantly fewer errors than Reception Station personnel on the center-of-mass job sample, but that the two groups did not differ in speed of performance. Correlational analyses failed to reveal a relationship between the job sample and gunnery performance.

Biers and Sauer (1982) examined the relationship between a stationary engagement job sample and gunnery performance defined by the most recent gunnery qualification score. This job sample was intended to capture the tank commander's skill in providing an initial lay on the target. Their job sample required gunners and tank commanders to use actual M1 tank commander sights and controls to lay the reticle on a slide projection of a black dot. As before, both speed and accuracy measures were obtained from the job sample. As expected, tank commanders were significantly faster and more accurate than gunners at this job sample since they have more experience at using the commanders sights and controls. The only significant relationship between the job sample time and gunnery qualification performance was that for those qualifying at the gunner station; however, the relationship was opposite from the predicted direction: Longer gun lay times were associated with higher qualification scores and vice versa.

Kress (1981) tested the relationship between a stationary engagement job sample and gunnery performance. Skill at stationary engagements was tested by having gunners fire at reflective targets using an M55 laser mounted coaxially with the main gun. The results indicated that job sample performance was significantly correlated with time measures derived from Table VIII. As

expected, gunners taking more time to complete the stationary engagement job sample also took more time to complete Table VIII engagements. A less expected finding was that gunners who were more accurate at the stationary engagement job sample took more time to complete Table VIII engagements.

In summary, the research data failed to show a relationship between sight picture knowledge and gunnery performance. When this knowledge is combined with the minimal tracking skill required in stationary engagements, the predictive relationship to gunnery performance is quite mixed: One study fails to show a relationship, others found significant relationships in the expected direction, while still others found significant relationships in unexpected directions. Nevertheless, the research findings were relatively unambiguous that stationary tracking skill is trainable.

Tracking/Moving Engagements

Eaton, Johnson, and Black (1980) found that tracking performance on a job sample test (diamond, but not circle, pattern on Willey BOT) was correlated with performance on a modified Table VI. In other words, good gunners evidenced better tracking skill. This relationship cross-validated across all three phases of the research. However, they found conflicting evidence as to whether or not this skill is trainable. They found no differences between gunners and loaders who presumably differ in gunnery training and experience (Phase II). In contrast, a longitudinal comparison (Phase III) showed differences between subjects in the Reception Station and subjects who had completed 8 weeks of BAT.

Campbell and Black (1982) modified the diamond tracking task described by Eaton et al. and used it as a job sample for predicting entry level training performance. The results showed an inconsistent relationship between the tracking job sample and training performance across the two companies of M1 crewmen that were tested. The first company showed a significant positive relationship between tracking accuracy and training performance defined by the instructor rankings and course tests. In contrast, the second company showed a significant positive relationship between tracking speed and training performance defined by the instructor rankings only. Neither company demonstrated a significant correlation between performance on the diamond tracking job sample and gunnery performance.

Two studies (Biers & Sauer, 1982; Black & Mitchell, 1986) examined the relationship between a computerized target tracking task and gunnery performance. The task required armor crewmen to track a randomly moving dot on a computer monitor with a joystick. Correlational analyses in both studies indicated no significant relationships between performance on this job sample and gunnery qualification scores. However, there was evidence that the computerized tracking task was not an appropriate job sample for tracking the in M1: (a) Biers and Sauer demonstrated that less experienced personnel (drivers and loaders) performed significantly better than personnel who should have more experience with the M1 sights and controls (gunners and tank commanders); and (b) Black and Mitchell failed to demonstrate a relationship betwen the computerized tracking sample and the hands-on job sample (described

below) which is more similar to the actual task. Biers and Sauer noted that stimulus-response relationships required by the job sample were not analogous to those required in the actual tank, which may have caused negative transfer from the tank to the job sample.

These same two studies studied the relationship between a hands-on tracking task wherein armor crewmen were required to follow a "snakeboard" track using both the gunner and tank commander sights and controls on an actual M1. Both studies found a relationship between performance on the tracking job sample and gunnery performance, but the relatioships were not consistent. Biers and Sauer (1982) found a relationship between the total number of hits on the job sample and the most recent qualification score while the subject was in the tank commander's seat. However, this relationship is opposite from expectations, i.e., lower numbers of job sample hits was associated with higher qualification scores. In contrast, Black and Mitchell (1986) showed a significant relation between performance on the job sample and performance on the night portion of Table VIII.

Kress (1981) also found some significant and predictable relationships when tracking skill was measured within the context of a moving target engagement job sample. As in the stationary engagement job sample described above, his gunners were tested in their speed and accuracy at using an M55 laser to hit reflective targets. In the present sample, however, the targets were moved either to the left or right. Although speed measures derived from job sample performance did not significantly correlate with Table VIII performance, the job sample accuracy measures evidenced some rather strong relationships with Table VIII performance measures: the percent of hits, the percent of target hits, and the percent of target engagements.

The research described above concerns tracking targets from a stationary tank, i.e., stationary/moving engagements. In contrast, Harris, Melching, Morrison, and Goldberg (1982) addressed the specific issue of training gunnery from a moving platform, i.e., moving/moving engagements. Harris et al. identified two sources of "error" input that operate during tracking to draw the reticle off target. The first source of error is due to the movement of the target relative to the firing tank. This sort of error is common to both stationary/moving and moving/moving engagements. Moving/moving engagements have an additional source of error: that caused by the movement of the firing tank. Their training program consisted of a knowledge component that presented moving platform gunnery principles and a practice component that employed a simple response device for practicing moving/moving skills. However, results from an evaluation of the training program failed to provide evidence that moving platform gunnery skills can be trained: Performance on the practice device did not improve over trials, and moving/moving skills did not transfer to the criterion performance device, the Fire Control Combat Simulator (FCCS), which simulates moving/moving engagements.

In summary, there was some evidence that tracking skill correlates with gunnery performance although this relationship was not found in one study (Biers & Sauer, 1982). It also appears that tracking is a trainable skill. In the context of moving engagements, the findings are again mixed: While one study found a predictable and strong relationship between tracking moving

targets and gunnery performance (good tracking associated with good gunnery), another showed opposite relationships (good tracking associated with poor gunnery). Finally, the timing skills required in moving/moving engagements may not be trainable.

Firing Subsequent Rounds

Although tank fire control systems have become increasingly accurate, tank gunners do not always hit designated targets on the first round fired. There are two identifiable skill/knowledge components that are associated with firing subsequent rounds at the target: (a) observing the initial round, which is primarily perceptual in nature; and (b) adjustment techniques, which is primarily a knowledge-based activity. These two topics are discussed below.

Observation¹

Observation refers to announcements made by the gunner or tank commander with regard to the relation of the round or its effects to the target. These observations provide the basis for adjustment of fire. One of the following five terms to describe an observation: (a) "target" meaning the target was observed to be hit, (b) "lost" indicating that neither the round nor its effects were observed, (c) "over" where the round is observed above the target, (d) as oppose to "short" where the round is observed to fall short of the target, and (e) "doubtful" indicating that the round was observed to the right or left of the target but at the correct range, i.e., it is doubtful that a range correction will need to be applied.

Eaton, Johnson, and Black (1980) examined the relationship of a "sensing" job sample to gunnery performance. In their job sample, armor personnel viewed a photographic slide presentation of a typical gunnery range target array upon which a tachistoscope superimposed a red blip to simulate a round fired. The subjects indicated their sensing of the round by drawing the location on a hand-drawn replication of the target slide. The distance between the subject's indicated sensing and the actual location was computed. Eaton et al. found that round sensing was positively related to Table VI (modified) performance. In other words, good gunners sense rounds better than poor gunners. The relationship cross-validated for the first two phases of the research but not the third. Their results also provided mixed evidence concerning the trainability of the sensing/observation skill: If the skill were trainable, one would expect differences between recent graduates of entry level training who received either gunner and loader training; no such difference was observed. However, comparison between armor personnel assigned to the Reception Station (i.e., prior to training) and personnel who had

¹Techniques of observation were formerly referred to as "sensings" in earlier armor doctrine.

received eight weeks of entry level training indicated a significant advantage in sensing performance for the latter group.

Campbell and Black (1982) modified the Eaton et al. sensing job sample to more accurately reflect job requirements. Instead of binocular viewing in the Eaton et al. job sample, Campbell and Black required monocular viewing as required in the actual tank. Also, subjects indicated their sensing/observation by manipulating a gunner's control handle to place the reticle where the simulated burst was perceived. Their results indicated that performance on the round sensing task was positively related to Table VII performance for one of the two samples of BAT trainees tested. However, round sensing was not related to any of the other criteria in their study.

In conclusion, observation skills do appear to be related to gunnery performance. However, it has not been established whether or not these skills are trainable.

Adjustment of Fire

Doctrine on the preferred fire adjustment techniques has changed with the advent of the advanced fire control systems in the M60A3 and M1 tanks. Currently, the preferred adjustment technique is the reengagement method. This method requires that, after missing the target, the gunner dump the ballistic solution by releasing his palm switches momentarily and reentering a new solution by relaying the reticle and relasing to the target. Previously, the preferred adjustment technique was the burst-on-target (BOT) method. Simply stated, this adjustment required the trainee to note where the round was sensed on the reticle and to adjust the sights so that point on the reticle was placed on the target's center of mass. The research cited below concerns the latter technique of fire adjustment.

Kress (1981) designed two fire adjustment job samples similar to his sight picture job sample described in the previous section. The first job sample (Apply Sight Reticle for Fire Adjustment) tested gunners' ability to make an appropriate adjustment in response to a subsequent fire command. A line drawing provided a depiction of the target and the aiming point of the first round. In addition, the appropriate fire command elements were printed on the drawing. Gunners demonstrated their knowledge for a particular fire adjustment technique by positioning a reticle drawn on a clear plastic overlay with respect to the target. The second job sample (Determine Fire Adjustment) tested the tank commander's ability to announce the appropriate sensing/observation and to issue an appropriate fire command. The subject was provided with a line drawing of the target and a dot representing the perception of a round. Performance on both job samples was measured as a percent of correct responses. Performance on neither was related to measures derived from Table VIII.

The following research concerns not only the knowledge of fire adjustment techniques but also the ability to use that knowledge to correctly adjust fire on training devices. Eaton (1978) measured the number of hits achieved using BOT method on the Willey device. His results indicated a significant

relationship between BOT accuracy and performance on the battlesight engagements of Table VIII such that the greater number of hits was associated with longer engagements times. This correlation is difficult to interpret. However, time measures on the Willey were correlated with accuracy on Table VIII such that faster BOT times were associated with more accurate Table VIII battlesight engagements. No relationship was detected between the number of BOT hits and the number of successful battlesight engagements for Table VIII.

Eaton et al. (1980) used the FCCS device to test armor trainees' ability to adjust fire after missing an initial round. A constant error was programmed into the FCCS so that the subject would miss with the first round, but could adjust fire using the burst-on-target technique. Job sample performance was scored in terms of the total number of second round hits achieved on the FCCS. Correlational analyses failed to indicate a relationship between performance on the round adjustment job sample and gunnery performance on Table VI.

In summary, these findings failed to indicate a relationship between the skills and knowledges related to adjusting fire and gunnery performance. No research has been performed to determine whether or not these skills/knowledges are trainable.

Knowledge of Armor Procedures

The final category of skills and knowledges is that regarding armor procedures. Procedural knowledges cut across all phases of gunnery and are increasingly important as the fire control system have become automated. A crucial gunnery-related procedure is that required to systems calibrate the main gun. Subject matter experts often claim that the knowledge and skill related to systems calibration account for much of the between-subject differences in gunnery performance. As is true of similar complex procedures, this task should be performed with the aid of a technical manual (TM). Other important gunnery related procedures are those related to operating the ballistic computer. These procedures include the computer self-test, computer data check, and fire control system checks.

Campbell and Black (1982) tested armor trainees on their ability to use the TM for the M1 tank (TM 9-2350-255-10). The 13-item test was divided into three parts: (a) use of the index, (b) reading and comprehending information on specified pages of the TM, and (c) location, reading, and comprehending information within a given section of the TM. The measure of performance for this job sample was the percent of items answered correctly. Performance on the job sample failed to correlate with any of the gunnery and training performance criteria measured in their study.

In contrast to the previous study related to using the TM, there are three different demonstrations that job samples designed to simulate operation of the ballistic computer correlate with some aspects of gunnery proficiency. In the first, Campbell and Black (1982) used a programmable calculator to simulate the functions of the ballistic computer. The soldier's task was to

follow instructions that were prepared in TM format to enter fire control data. Two measures of job sample performance were recorded: the number of steps correctly completed and the total time to complete the task. The accuracy measures did not correlate with any of the job performance criteria measured by Campbell and Black. However, the time to complete the task negatively correlated with Gate scores and instructor rankings for the first company of M1 trainees, i.e., low times were associated with high criteria scores. However, this relationship failed to replicate for the second company of M1 trainees tested in the study.

Biers and Sauer (1982) developed a similar job sample designed to measure performance on entering data and self-testing the ballistic computer; this same computerized job sample was later tested by Black and Mitchell (1986). This job sample was simulated by microcomputer that presented a graphic depiction of a computer control panel. Trainees interacted with the computer by means of a light pen. Speed and accuracy of performance were measured on 10 trials in which the subject was required to enter data and 10 simulated computer self-tests. Biers and Sauers found that the number correct on the job sample was significantly and positively related to the most recent Annual Qualification score as recalled by both TC and gunner, i.e., higher job sample scores are associated with high gunnery qualification scores. In contrast, Black and Mitchell (1986) found no relationship between the computerized job sample and actual Table VIII performance.

Thus the results from relating procedural skills and knowledges related to operation of the ballistic computer to gunnery proficiency are mixed. However, whether or not these performance components are trainable has not been tested.

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APPENDIX D ANALYSIS OF THE GRAFENWÖHR GUNNERY DATABASE

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ANALYSIS OF THE GRAFENWÖHR GUNNERY DATABASE

There were potentially a great number of questions that could have been addressed by the Grafenwöhr gunnery database. To focus our efforts, we posed a few a priori questions or issues that we considered to have the greatest relevance to the present project. These questions may be stated as follows:

- 1. What types of engagements are particularly difficult for tank crews? Anecdotes concerning the difficulty of armor engagements abound, e.g., that moving targets are more difficult than stationary ones, that engaging rights on the offense (i.e., while moving) is more difficult than engaging ι gets from the defense (i.e., while stationary), and that degraded engagements are more difficult than precision. There are comparisons of engagements within Table VIII that would permit empirical tests of these assertions.
- 2. What sorts of procedural errors are likely to occur during a gunnery engagement, and what is their effect on gunnery performance? Again, anecdotal suggestions indicate that procedural errors are pervasive problems in tank gunnery. With regard to this issue, Table VIII evaluators score not only the outcome of gunnery performance, but they also score crews on predefined procedural errors as well.
- 3. What is the effect of experience on gunnery performance? Our research mandate was to identify "persistent" performance problems. Therefore, we were more interested in a performance problems that do not change over time than those that lessen with experience.
- 4. What are the correlations in performance between tasks in Tables VIII? These correlations would provide an index of the psychological similarity between the engagements. In addition, intertask correlations could to estimate the psychometric reliability of Table VIII as test of performance.

<u>Method</u>

Sample

The sample on which the following analyses were based consisted of all M1 crews except those commanded by officers that attempted gunnery qualifications at Grafenwöhr in the period January-July 1986. Because of missing data problems, the <u>ns</u> were not consistent across comparisons; nevertheless, most comparisons are based on 600-800 different crews. The exception to this generalization was Task 5. From the data, it was obvious that, more often than not, Task 5 was presented in place of the alternate task, 5A, in Table VIIIA; whereas Task 5A appeared to be chosen more often over Task 5 in Table VIIIB. Consequently, Task 5A of Table VIIIA and Task 5 of VIIIB are based on much smaller <u>ns</u>, i.e., usually less than 20.

The Database

The Grafenwöhr Table VIII data is implemented on an IBM mainframe computer program called the Structured Query Language/Data System (SQL/DS). Although a powerful database management system, SQL/DS provides only a few built-in statistical functions, of which the more useful include (a) count records having stated criteria, (b) identify maximum and minimum values of a variable, and (c) calculate the sum and the average value of a variable. One of the most serious shortcomings of SQL/DS is its lack of a built-in function for calculating the variance or the standard deviation of variables.

Statistical Analyses

To the extent possible, descriptive analyses were performed for all engagements. The exceptions were the machinegun engagements—Task 3 in both Tables VIIIA and VIIIB. The criteria for a first—round hit in a machinegun engagement is different than measurement of a first—round hit with main gun round. Because this measure is incommensurate with accuracy measurement in the rest of the table, the first round hit rates were not reported for this task. In contrast, the opening times for machinegun engagements are analogous to opening times for main gun engagements. Therefore, opening times for machinegun engagements were included. Also, data from engagements are Task 5A of Table VIIIA and Task 5 of VIIIB were included in the descriptive analyses in the interest of completeness, despite the fact that they were based on small sample sizes. As a result, however, the sampling error associated with these statistics is unacceptably large due to small sample sizes. Therefore, the results from these engagements are excluded from the inferential tests of significance.

The differences between hit rates were evaluated with the Chi-square test of independence. The appropriate test for the opening times was the One-Way Analysis of Variance (ANOVA). ANOVA computations were complicated by the fact that SQL/DS software did not calculate an estimate of the population variance. However, information from the US Army Armor and Engineer Board provided a technique for estimating the significance of the latter differences.² The Armor Board obtained the Grafenwöhr data from OCOA, had it transferred to diskette by DOIM, and analyzed it with the PC version of SPSS. We obtained their SPSS output, which provided standard deviations of opening times for each individual engagement at Grafenwöhr. There were some subtle differences between the database we obtained from OCOA and that analyzed by the Armor Board, however. For one, our database covered crews who underwent qualification from January to July of 1986, whereas the Armor Board's database covers two fewer months (February to June 1986). Second, their data included all crews, whereas ours excluded crews commanded by officers. We speculate that the additional officer data probably increased rather than decreased

¹We thank Mr. Robert Cisco of OCOA for providing access to the system and in helping to interpret the results.

²We thank Mr. Albert Pomey of the Armor Board for providing these data.

variability. As a result, use of the Armor Board's variability estimates probably resulted in a conservative test of significance. Therefore, the ANOVAs of opening time data should be regarded as only approximate tests of significance.

Results and Discussion

Differences Between Types of Engagements

Tables D-1 and D-2 provide a breakdown of performance on Tables VIIIA and VIIIB respectively by individual engagements (tasks). In addition to hit probabilities and opening times, the table also includes sample sizes (in parentheses) on which the statistics were based. The results are interesting in that they do not confirm conventional wisdom concerning "difficult" engagements. Consistent low hit rates or high opening times were not associated with either moving (offensive) engagements, moving targets, or degraded mode (battlesight) engagements. Despite the failure to find these expected differences, there were some unexpected differences between engagements that were explainable, at least after the fact. These are discussed below.

The most obvious trend from the data was that higher first-round hit rates and faster opening times were associated with shorter target ranges. There was also a similar relationship between gunnery performance and the size of the target, e.g., large tanks were hit more often than smaller armored personnel carriers. These relationships were perfectly reasonable assuming that distant and/or small targets are difficult to acquire and engage. However, it is also reasonable that the M1 fire control system is less accurate for distant and/or smaller targets. Thus the effect of target range and size may not be exclusively due to human performance deficiencies.

Task 4 in Table VIIIA is associated with especially poor performance that cannot be attributed to target range or size. This assertion is supported by a comparison of Tasks 4 and 5 of Table VIIIA. Performance on Task 4 is markedly poorer than performance on Task 5 despite the fact that both are moving engagements using precision techniques and that targets for both tasks are two T72 tanks at 1400-1600 meters. One difference between the two engagements is that the two target tanks are stationary in Task 4 whereas they are moving in Task 5. However, this stationary/moving difference does not explain the difference in performance between the two tasks, because one would expect poorer performance on Task 5 than on Task 4--a difference that is counter to findings.

We speculate that the key difference between Task 4 and 5 is that 4 is performed in an NBC environment whereas Task 5 is not. By NBC environment is meant that the crew is "buttoned up" in the tank (i.e., hatches are closed) and is wearing mission-oriented protective posture (MOPP) gear, which may include (depending on MOPP level) an overgarment, overboots, mask/hood, and gloves. A subject matter expert from OCOA confirmed that the MOPP gear would indeed degrade performance to the extent observed between Task 4 and Task 5

Table D-1

Gunnery Performance on Table VIIIA

	-		get	
	Fir		Second	
Task	prob. (1st_rnd hit)	opening time	prob. (2nd round hit) ^a	opening time
VA.	(130 The litter		(End Today 1170)	C 1000
. Engage multiple targets (defense) using	.900	3.42	.836	12.03
AS/battlesight techniques.	(705)	(726)	(627)	(635)
Targets: 1 stationary T72 at 900-1300m 1 moving T72 at 900-1300m				
. Engage simultaneous targets (defense)	.851	2.57		9.31
sing GPS/precision techniques.	(549)	(723)		(467)
Targets: 1 stationary BMP at 900-1300m 1 RPG team at 400-1100m				
. Engage multiple targets (offense)	•••	5.36		•••
sing GPS/precision techniques.		(727)		
Targets: 1 set of troops at 400-600m 1 set of troops at 700-900m				
. Engage multiple targets (offense)	.660	7.59	.674	16.38
sing GPS/precision techniques in an BC environment.	(723)	(732)	(472)	(477)
Targets: 2 stationary T72s at 1400-1600	m			
. Engage multiple targets (offense)	.841	6.55	.854	14.52
sing GPS/precision techniques.	(694)	(703)	(584)	(584)
Targets: 2 moving T72s at 1400-1600m				
A. Engage multiple targets (offense)	.737	7.48	.786	18.86
sing GPS/precision techniques.	(19)	(23)	(14)	(14)
Targets: 1 stationary T72 and				
1 moving T72 at 1400-1600m				

^aConditional upon obtaining first round hit on first target

Table D-2

Gunnery Performance on Table VIIIB

	_			rget		
	_	Firs			Second	
		prob.	opening	40.00	prob.	opening
Task	(1st	rnd hit)	time	(2nd	round hit)a	time
l. Engage a target (defense) using		.808	4.54			
GPSE/precision techniques and a three-man configuration.		(719)	(729)			
Target: 1 stationary T72 at 1400-1600	m					
. Engage multiple targets (defense) using		.789	3.61		.821	11.55
PS/precision techniques.		(697)	(711)		(541)	(550)
Target: 2 stationary BMPs at 1200-140	Om					
i. Engage multiple targets (offense) using		.918	6.49			14.14
PS/precision techniques in an NBC nvironment.		(692)	(706)			(635)
Targets: 1 stationary BMP and 1 RPG team at 400-600m						
. Engage multiple targets (offense) using		.762	7.06		.814	15.74
PS/precision techniques.		(686)	(708)		(522)	(523)
Targets: 1 stationary T72 and 1 moving T72 at 1300-1500m						
. Engage a target (defense) using GAS with		.684	8.20		•••	
llumination from a stationary tank.		(19)	(20)			
Target: 1 stationary T72 at 1200-1400	m					
A. Engage a moving target (defense) using		.782	4.17		•••	
PS/precision techniques.		(684)	(688)			
Target: 1 moving T72 at 1700-1900m						

 $^{{}^{\}mathbf{a}}$ Conditional upon obtaining first round hit on first target

performances. The results of Task 3, Table VIIIB apparently contradict the previous interpretation. Despite the fact that this task also requires MOPP gear, performance is relatively good. In fact, performance is better on this task than any other engagements in Tables VIIIA and VIIIB. When asked to reconcile this apparent contradiction, the subject matter expert pointed out that the 400-600 meter target range for that task is the shortest range on both tables. He further stated that any target in the 500 meter range is generally regarded as a "gimme" in that it does not require a precise target lay. In other words, he thought that the engagement was so easy that MOPP gear was not a factor.

Effects of Time in Position

Tables D-3 and D-4 compare performance of crews differing in time in position for the tank commander and for the gunner, respectively. For the accuracy measure (first-round hits), the data failed to indicate increased performance as a function of time in position for either the tank commander or the gunner. In fact, there is a slight but nonsignificant trend in the opposite direction.

The relationship between time in position and opening time is more complex. One would expect that longer time in position to be associated with shorter opening times. There was a slight trend in that direction over all the tasks, but only two tasks show a significant trend in the expected direction: Task 2, Table VIIIA and Task 1, Table VIIIB--both effects of tank commander experience. Curiously, both of these tasks are stationary/stationary engagements, purportedly the easiest types of engagements. One would have expected tank commander experience to have had its greatest effect on the more difficult tasks. The only significant trend as a function of gunner as well as tank commander experience was the machinegun engagement: Table VIIIA, Task 3. However, the relationship was nonmonotonic in both cases: Crews in the middle category of experience were the slowest, followed by the least experienced crews, and finally the most experienced. In summary, the effects of time in position on gunnery performance are complex and not clear from the present data.

Procedural Errors

Crew cuts are procedural errors that result in points being deducted from a crew's Table VIII qualification score. Evaluators score crews on 22 different errors, 18 of which are applicable to the M1. Table 5 presents the percentage of engagements in which crew cuts were observed. Note that only 10 of the total 18 possible M1 crew cuts were actually observed in the FY 86 data base. The most likely of these infrequent errors were the two crew cuts related to fire commands: (a) incorrect initial or subsequent fire command, and (b) incorrect response to initial or subsequent fire commands. Nevertheless, the most striking result from these data is the relative infrequency of procedural errors. One may reach two possible conclusions: (a) that the procedural errors in fact infrequently occur, or (b) that Table VIII evaluators do not detect the errors as often as they occur. The latter

Table D-3

Performance on First Target for Crews Differing in Tank Commander Time in Position

Table		Ten	Test		
Task		0-5 Months	6-11 Months	12 or more Months	Statistic
AIIIA					
1 - Faces					
1. Engage multiple (.916	.897	.888	
	p(hit) opening time	3.60	3.35	3.28	1.13 1.17
	opening time	3.60	3.33	3.20	1.17
2. Engage simultaneo	ous targets (defense	·).			
	p(hit)	.833	.845	.815	3.75
	opening time	2.94	2.55	2.18	5.96**
3. Engage multiple t	ergets (offense)		,		
J. Linguige marteriple	p(hit)		•••	•••	•
	opening time	5.58	5.85	4.71	7.79**
	Danes Co.				
4. Engage multiple t	argets (offense).				
	<u>p</u> (hit)	.654	.676	.652	0.36
	opening time	7.96	7.44	7.32	0.75
5. Engage multiple t	argets (offense).				
	p(hit)	.869	.853	.802	4.50
	opening time	6.70	6.85	6.13	1.98
VIIIB					
1. Engage a target (defense).				
	p(hit)	.828	.806	.788	1.37
	opening time	5.45	3.90	4.06	9.42**
2. Engage multiple t	armets (defense).				
c. Lugage mail ipie	p(hit)	.795	.795	.777	0.30
	opening time	3.71	3.24	3.82	1.92
3. Engage multiple t	argets (offense).				
	p(hit)	.912 6.31	.948 6.29	.899 6.85	3.61
	opening time	6.31	0.29	0.03	1.61
4. Engage multiple t	argets (offense).				
	p(hit)	.773	.782	.734	1.62
	opening time	6.99	7.00	7.19	0.19
5A. Engage a moving t	arget (defense).				
•	p(hit)	.789	.778	.778	0.11
	opening time	4.42	4.04	4.00	0.43

 $^{^{\}rm e}$ Chi-square for differences between hit rates and $\underline{\rm F}$ for differences between opening times.

^{*}p <.05; **p <.001

Table 0-4

Performance on First Target for Crews Differing in Gunner Time in Position

lab le			Test		
Task		0-5 Months	Gunner Time in Pos 6-11 Honths	12 or more Months	Statistic
IIA					
	STARTARILA MANUELLA				
1. Engage multiple		***	Value	***	
	p(h1t)	.889	.916	.908	1.13
	opening time	3.60	3.36	3.06	1.80
2. Engage simultane	ous targets (defens	e).			
	<u>p(h1t)</u>	.862	.842	.833	0.60
	opening time	2.65	2.49	2.50	0.17
3. Engage multiple 1					
3. Engage multiple	p(hit)	•••		•••	•••
	opening time	5.37	5.67	4.80	3.71*
	opening time	3.37	3.07	4.60	3.71
4. Engage multiple i	targets (offense).				
	<u>p</u> (h1t)	.666	.650	.662	C.16
	opening time	7.59	7.92	6.99	1.25
5. Engage multiple t	argets (offense).				
	p(hit)	.840	.846	.837	0.07
	opening time	6.82	6.28	6.32	1.08
118					
1. Engage a target (defense).				
	p(hit)	.810	.793	.832	0.87
	opening time	4.80	4.25	4.38	0.93
2. Engage multiple t	araste (defense)				
2. Engage materpla	p(h1t)	.798	.789	.766	0.59
	opening time	3.66	3.79	3.17	1.88
					• • • • • • • • • • • • • • • • • • • •
3. Engage multiple t					
	<u>p</u> (hit)	.931	.913	.892	1.88
	opening time	6.65	6.50	6.08	1.36
4. Engage multiple t	argets (offense).				
	p(hit)	.765	.792	.703	3.62
	opening time	7.24	6.90	6.89	0.53
5A. Engage a moving t	arget (defense).				
	p(hit)	.799	.767	.767	1.02
	opening time	4.47	4.04	3.63	1.51

^aCh1-square for differences between hit rates and \underline{F} for differences between opening times. * \underline{p} <.05; ** \underline{p} <.01

Table D-5
Percent of Engagements in Which Crew Cuts Were Observed

Crew Cut	Percent Engagements
Failure to adhere to conditions.	0.93
Incorrect engagement techniques.	0.40
Using incorrect weapon or ammunition.	0.21
Firing before reciving FIRE, UP, or announcing ON THE WAY.	0.02
Main gun not in safe position when loading.	0.01
Loader fails to close ammunition door during an engagement.	1.49
Incorrect initial or subsequent fire command	4.14
Incorrect response to initial or subsequent fire commands.	4.80
Incorrect driving techniques	0.12
Loader not securing spent casings.	0.05

argument is plausible given the fact that evaluators are seated on the top of the tank and score behavior through the TC's hatch.

As previously stated, procedural errors associated with the fire command were, by far, the most frequent observed of all crew cuts. Tables D-6 and D-7 summarize the relationship between fire command procedural errors and performance on each engagement. As expected, correct fire commands are associated with higher hit rates. However, the associations are significant on only 4 of the 20 comparisons. As might be expected, three of the four significant relationships involve "difficult" engagements: Task 4, Table VIIIA (the NBC engagement) and Task 5A, Table VIIIB (target at maximum range) for errors in both issuing and responding to fire commands. In contrast, ther remaining significant relationship between errors in response to the fire command and hit rate is Task 1, Table VIIIB—an "easy" stationary/stationary engagement, but requiring the crew to fire the tank in a three-man

Table D-6

First-Round Performance of Tank Commanders Issuing Either Correct or Incorrect Fire Commands

Table	Fire Co	ommand	Test
Task	Incorrect	Correct	Statistic ^a
	We the Wilder	THE STATE OF THE S	View W
IIIA.			
1. Engage multiple targets (defense).			
p(hit)	.833	.906	2.61
opening time	2.96	3.46	-1.45
2. Engage simultaneous targets (defense).			
p(hit)	.875	.850	0.12
opening time	2.25	2.59	-0.80
ne voca de la com			
Engage multiple targets (offense).			
<u>p</u> (hit)		- -	
opening time	6.12	5.35	0.92
4 Company multiple temperts (afferme)			
 Engage multiple targets (offense). <u>p(hit)</u> 	.400	.673	11.06**
opening time	9.42	7.50	1.84
The state of the s	••••	,	2.07
Engage multiple targets (offense).			
p(hit)	.741	.846	2.14
opening time	7.07	7.53	0.68
VIIIB.			
1. Engage a target (defense).			
p(hit)	.818	.808	0.02
opening time	3.98	4.56	-0.78

Engage multiple targets (defense).			
<u>p</u> (hit)	.775	.790	0.05
opening time	3.18	3.64	-0.83
a a construction of the construction of			
3. Engage multiple targets (offense).	.868	.920	1.29
<pre>p(hit) opening time</pre>	5.58	6.55	-1.66
opening time	3.30	0.33	-1.00
4. Engage multiple targets (offense).			
p(hit)	.750	.763	0.02
opening time	6.90	7.07	-0.24
5A. Engage a moving target (defense).	***	700	
p(hit)	.565	.790	6.57**
opening time	5.75	4.11	1.64

 $[\]overline{a}$ Chi-square for difference between hit rates and \underline{t} for differences between opening times.

^{*}p <.05; **p <.01

Table D-7

First-Round Performance of Crews Responding Either Correctly or Incorrectly to Fire Commands

Table		Fire C	Fire Command		
Ta	sk	Incorrect	Correct	Test Statistic ^a	
/IIIA.					
1	Engage multiple targets (defense).				
••	$\frac{p(hit)}{}$.794	.906	4.54*	
	opening time	3.38	3.42	-0.10	
2.	Engage simultaneous targets (defense).				
	<u>p(</u> hit)	.879	.849	0.22	
	opening time	2.33	2.58	-0.66	
2.	Engage multiple targets (offense).				
٥.	Engage multiple targets (offense). $\underline{p}(hit)$	•••			
	opening time	5.05	5.37	-0.44	
	The state of the s				
4.	Engage multiple targets (offense).				
	<u>p</u> (hit)	.562	.669	2.96	
	. opening time	8.91	7.47	1.80	
5.	Engage multiple targets (offense).				
3.	$\frac{p(hit)}{}$.821	.843	0.14	
	opening time	6.78	6.54	0.36	
AIIIB	•				
1.	Engage a target (defense). p(hit)	750	810	0.54	
	opening time	.750 6.50	.810 4.47	2.27*	
	opening time	0.30	4.47	2.27	
2.	Engage multiple targets (defense).				
	p(hit)	.667	.798	3.42	
	opening time	2.43	3.68	-2.18*	
- 12					
3.	Engage multiple targets (offense).	***	•••		
	<u>p</u> (hit) opening time	.908 6.75	.919 6.47	0.09 0.60	
	opening time	0.75	0.47	0.00	
4.	Engage multiple targets (offense).				
	p(hit)	.732	.764	0.23	
	opening time	7.39	7.04	0.58	
_000					
5A .	Engage a moving target (defense).	500	200	3 6644	
	<u>p</u> (hit) opening time	.500 5.94	.789	7.66** 1.49	
	opening time	3.74	4.13	1.49	

^aChi-square for difference between hit rates and \underline{t} for differences between opening times.

^{*}p <.05; **p <.01

configuration. Finally, the relationship between procedural errors and opening times is even more puzzling. Of the two significant findings, Task 1, Table VIIIB indicates faster opening times associated with correct responses to fire commands; whereas Task 2, Table VIIIB indicated the reverse.

Intertask Correlations

We had intended to examine the intercorrelations between performance on the engagements in Table VIII. This was not possible due to manner in which the database is organized. Database records correspond to individual engagements rather than to crew performance over all engagements. As a result, the SQL/DS system could not crosstabulate hits and misses on one engagement with hits and misses on another, nor could it calculate the crossproducts of the opening times. Without drastically reorganizing the database, we were not able to extract the information required to calculate intertask correlations.

Generalizability of Grafenwöhr Data

The data previously discussed was collected on a single range at Grafenwöhr. The advantage to having data from only one range is that test site conditions are relatively standard across crews. On the negative side, one could ask whether the results discussed here are limited to peculiar conditions at Grafenwöhr. Some data serendipitously obtained from the US Army Armor and Engineer Board³ addressed these issues. In addition to Grafenwöhr, the Armor Board maintains data on performance at other Table VIII sites in USAREUR and at Ft. Hood. In theory, Table VIII should be administered in standardized fashion according to the Tank Gunnery Tables (FM 17-12-1). To examine their agreement among Table VIII sites, we rank ordered engagements according to hit probability and opening times. In general, the same relationships discussed in the previous memo were evident at other sites as well, e.g., better performance on large/close targets as well as poor performance on Task 4, Table VIIIA (NBC engagement). To measure the agreement between Table VIII sites, we calculated Kendall's Coefficient of Concordance on the rank orders of the individual engagements. The results of this analysis indicated good agreement on the rank ordering of engagements for both hit probability (W = .71) and opening time (W = .78). Both coefficients are significant (p < .001) suggesting that the differences between Table VIII engagements described in the previous memo are not specific to the one range at Grafenwöhr.

³We again thank Mr. Albert Pomey of the Armor Board for these additional data.

APPENDIX E HIERARCHICAL SKILLS ANALYSES OF GUNNERY DOMAIN

APPENDIX E HIERARCHICAL SKILLS ANALYSES OF GUNNERY DOMAIN

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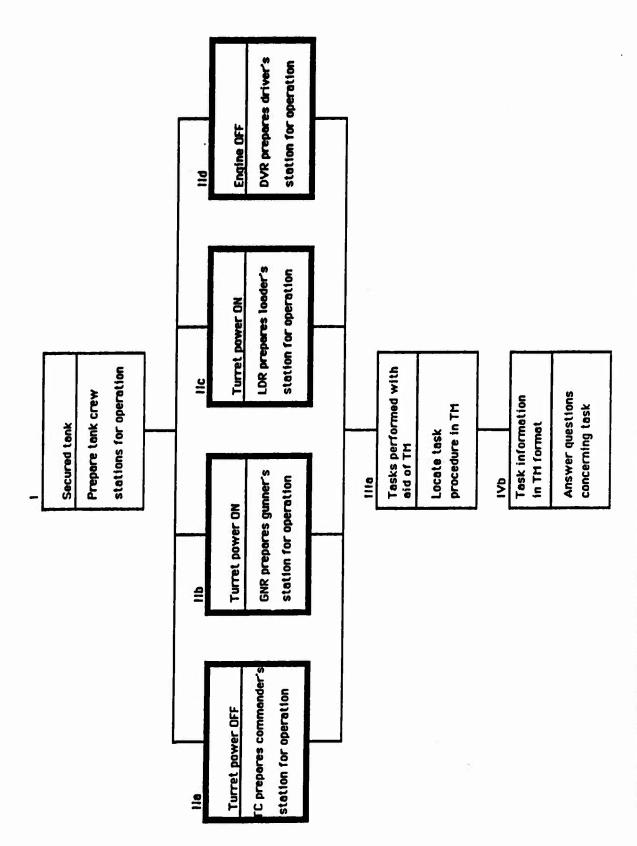


Figure E-1. Hierarchical skills analysis of Activity1: Prepare Stations for Operation (PREOPS).

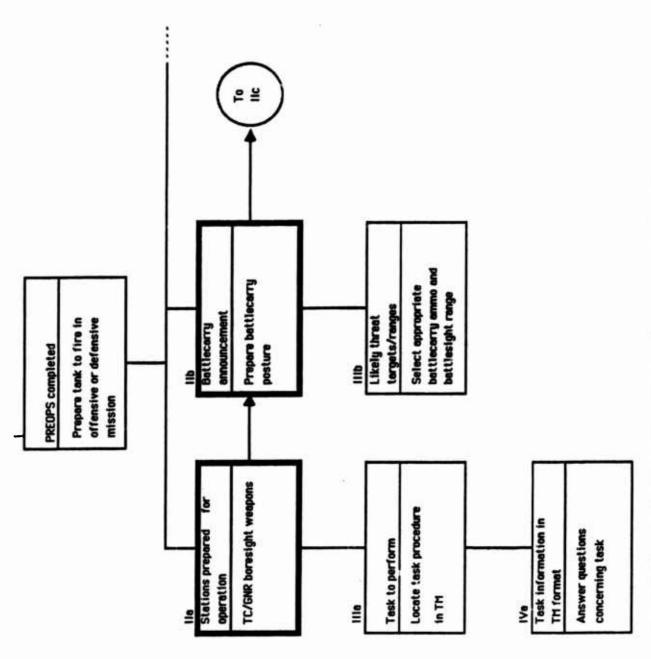


Figure E-2. Hierarchical skills analysis of Activity 2. Prepare Tank to Fire (PREFIRE).

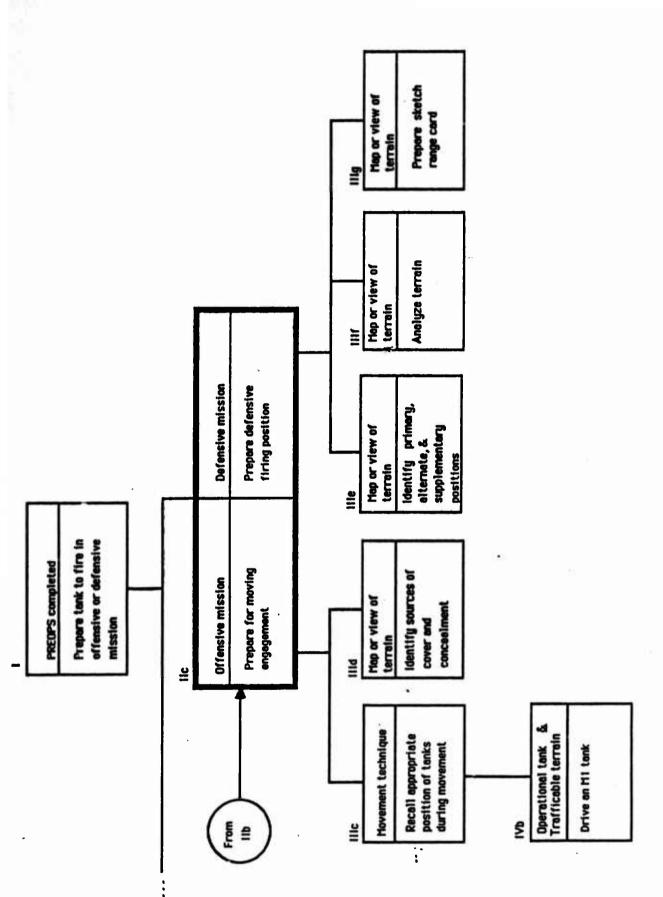


Figure E-2. Hierarchical skills analysis of Activity 2. Prepare Tank to Fire (PREFIRE) (cont'd).

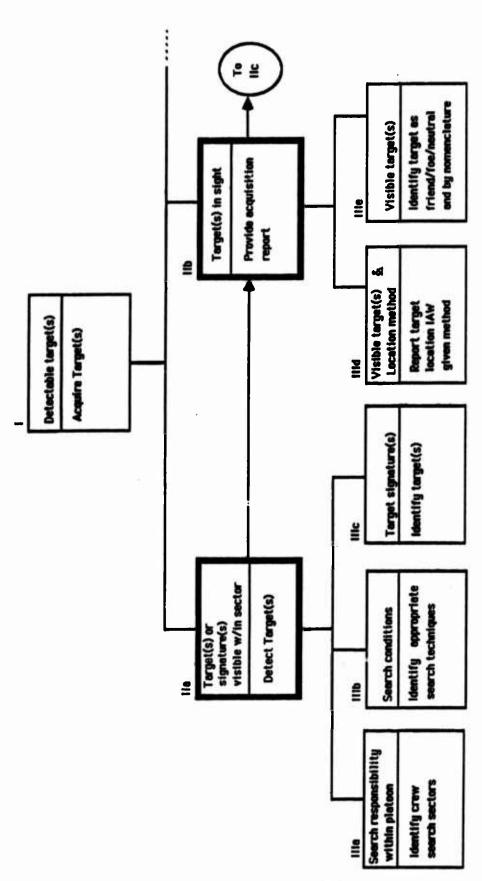


Figure E-3. Hierarchical skills analysis of Activity 3: Acquire Target(s).

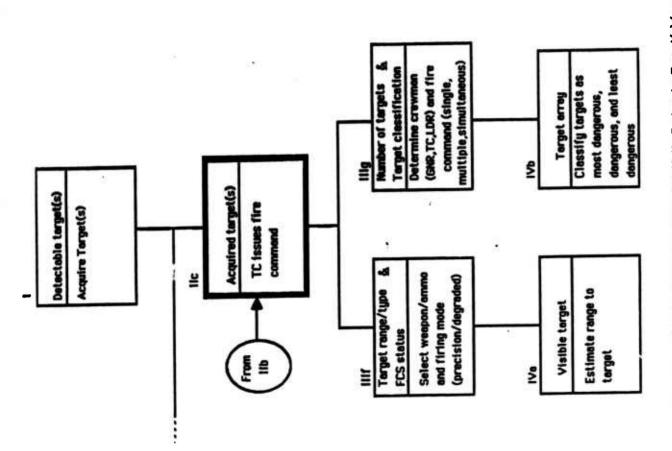


Figure E-3. Hierarchical skills analysis of Activity 3: Acquire Torget(s) (cont'd).

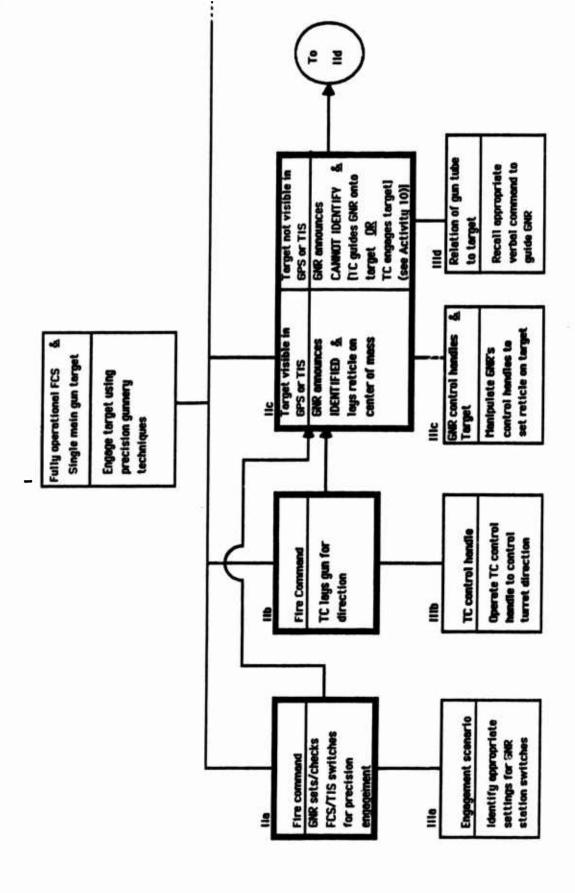


Figure E-4. Hierarchical skills analysis of Activity 4. Engage Single Target Using Precision Gamery.

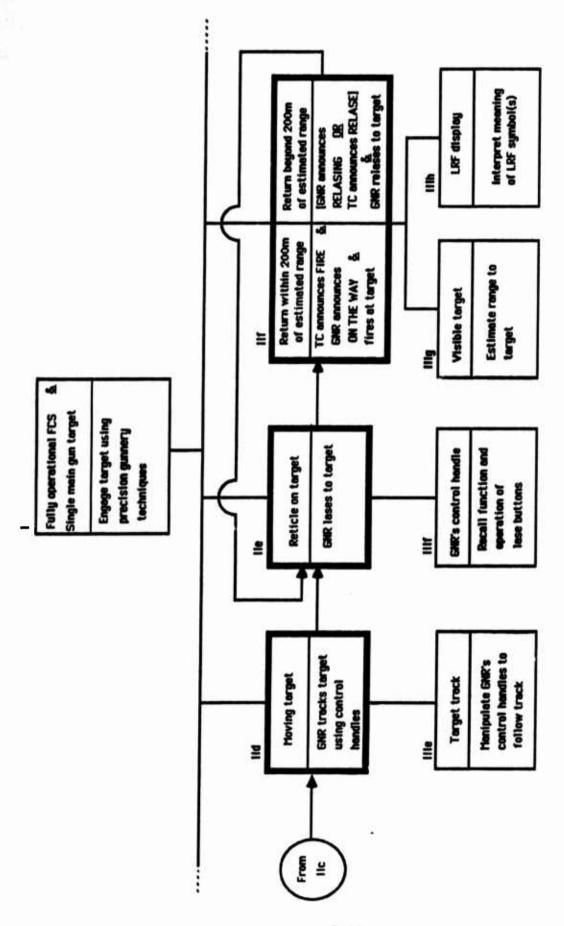


Figure E-4. Hierarchical skills analysis of Activity 4. Engage Single Target Using Precision Gunnery (cont'd).

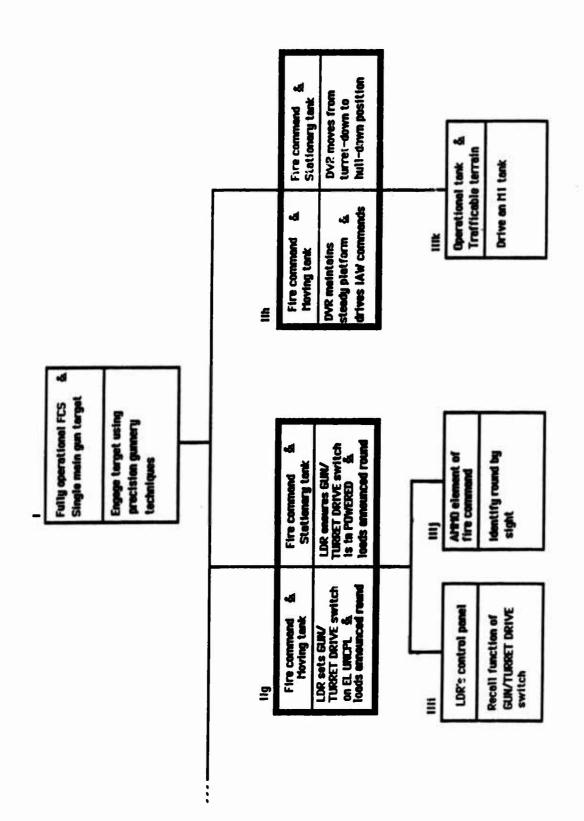


Figure E-4. Hierarchical skills analysis of Activity 4. Engage Single Target Using Pracision Gunnery (cont'd).

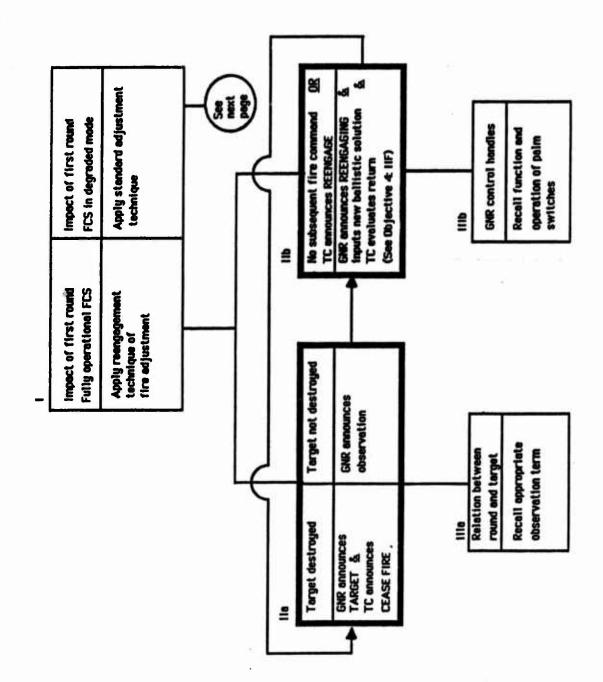


Figure E-5. Hierarchical skills analysis of Activity 5: Adjust Fire.

:

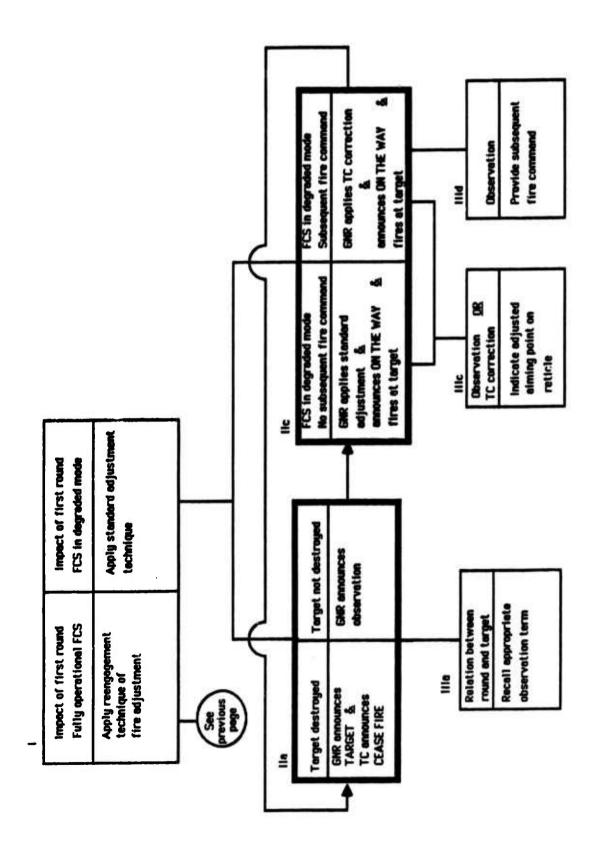


Figure E-5. Hierarchical skills analysis of Activity 5: Adjust Fire (cont'd).

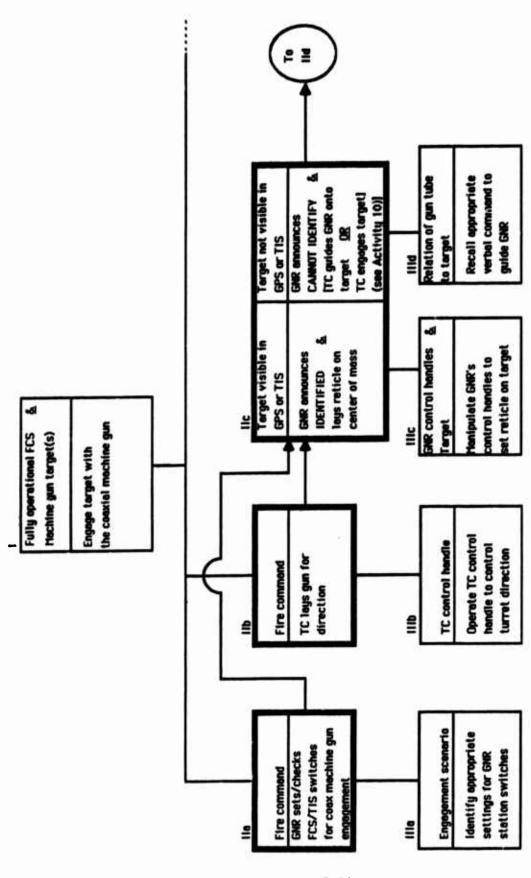


Figure E-6. Hierarchical skills analysis for Activity 6: Engage Target(s) With the Coax.

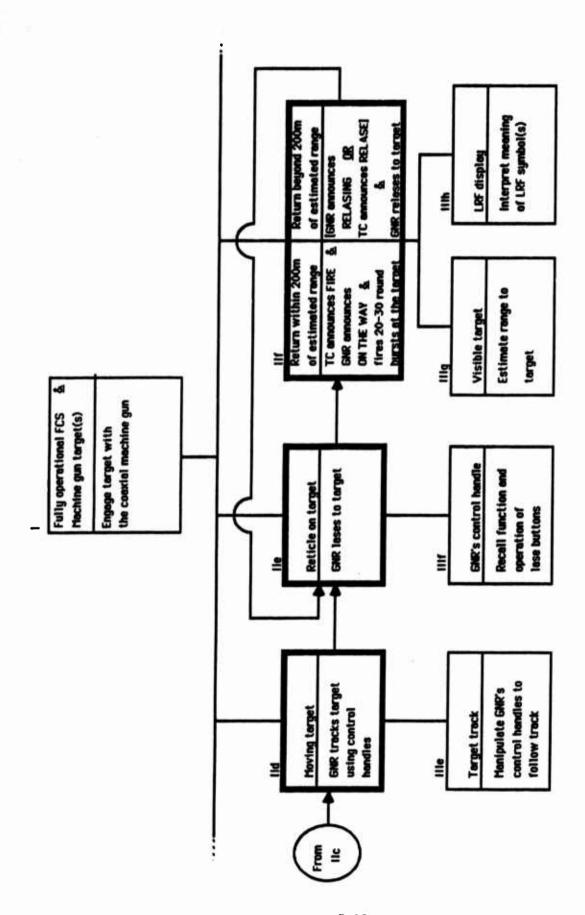


Figure E-6. Hierarchical skills analysis for Activity 6: Engage Target(s) With the Coax (cont'd).

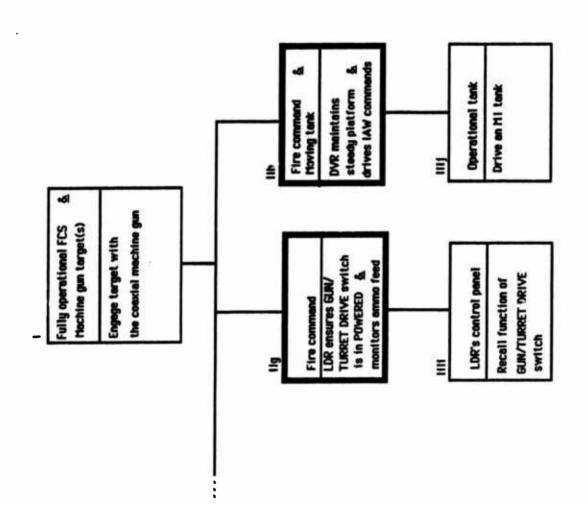


Figure E-6. Hierarchical skills analysis for Activity 6: Engage Target(s) With the Coax (cont'd).

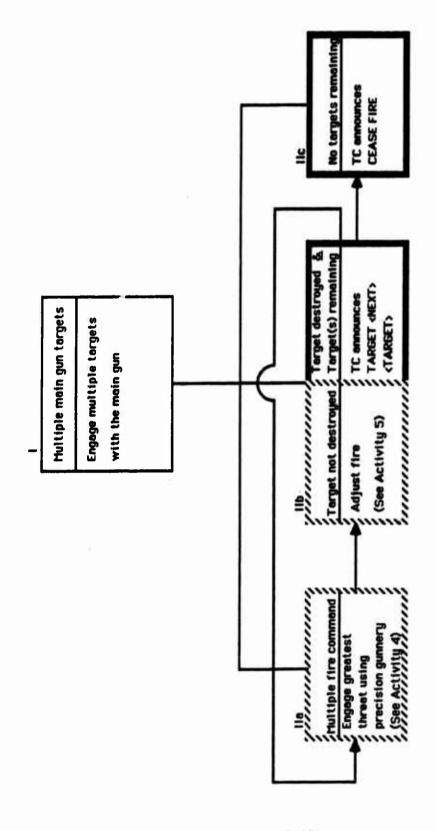


Figure E-7. Hierarchical skills analysis of Activity 7: Engage Multiple Targets.

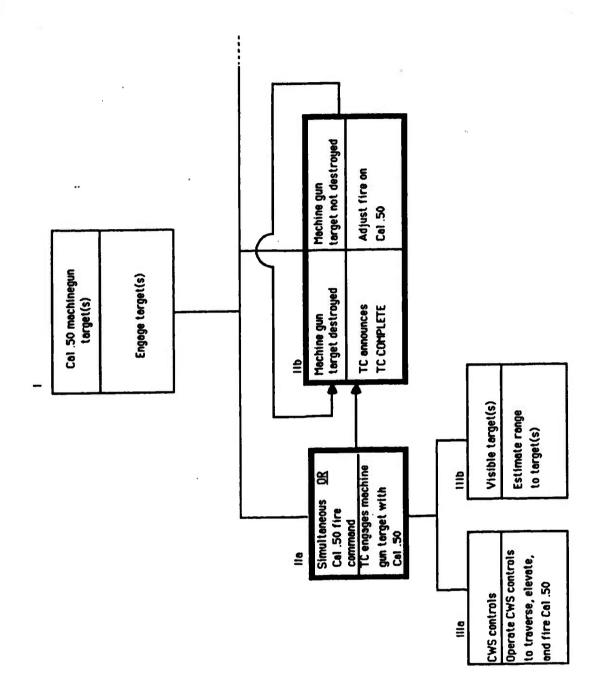


Figure E-8. Hierarchical skills analysis of Activity 8: Engage Cal .50 Targets.

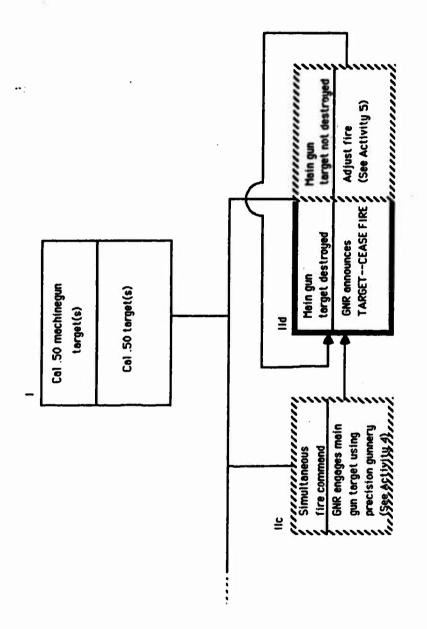


figure E-8. Hierarchical skills analysis of Activity 8: Engage Cal .50 Targets (cont'd).

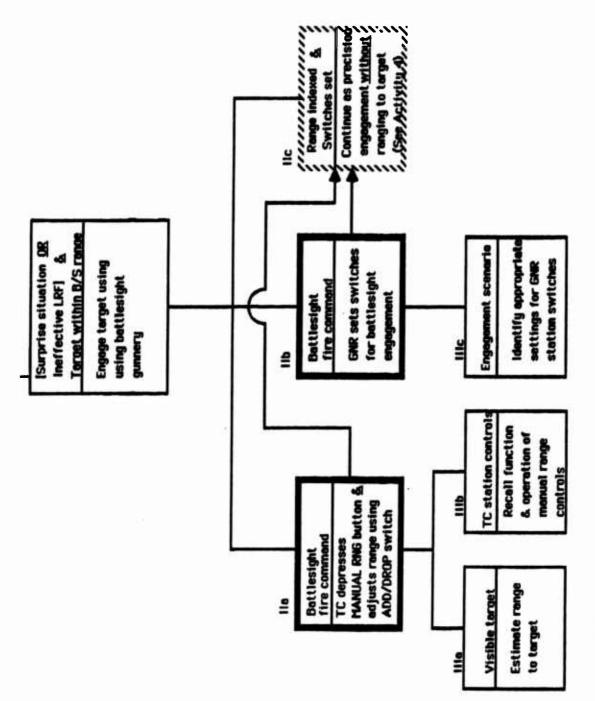
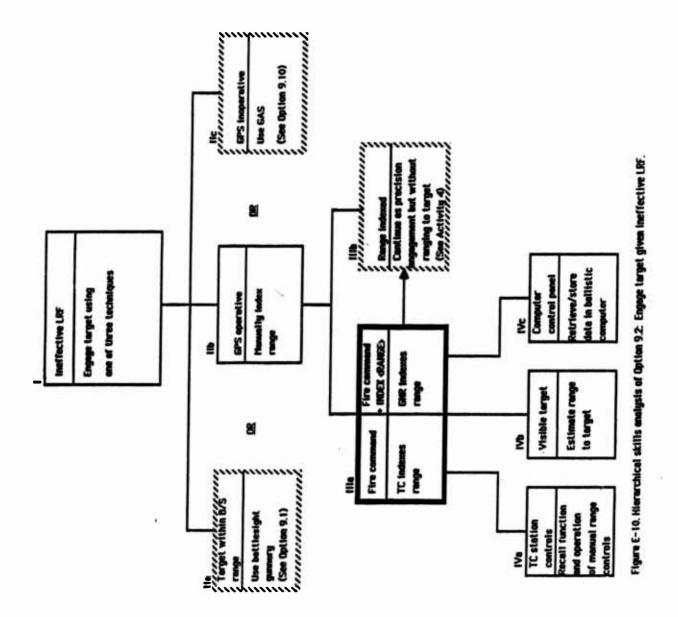


Figure E-9. Hierarchical skills analysis of Option 9.1: Engage target using battlesight gunnery.



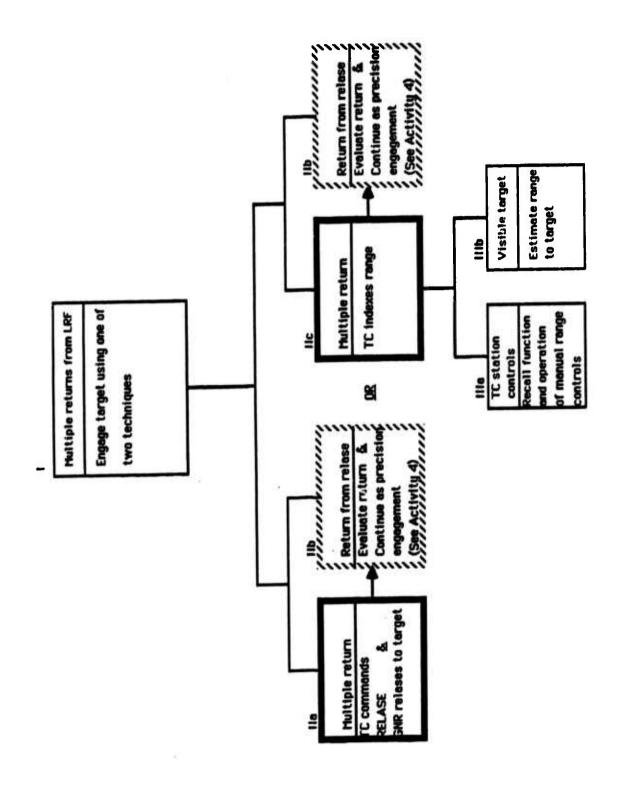


Figure E-11. Hierarchical skills enalysis of Option 9.3: Engage target given multiple returns from LRF.

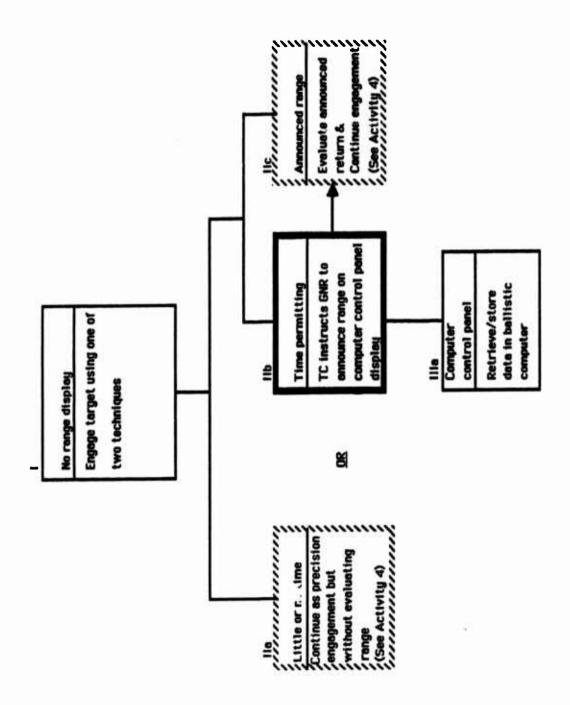


Figure E-12. Hierarchical skills analysis of Option 9.4: Engage target given no range display (loss of symbology).

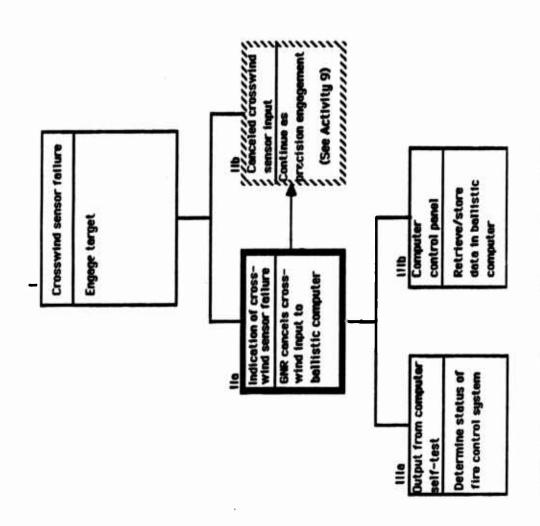


Figure E-13. Hierarchical skills analysis of Option 9.5: Engage target given crosswind sensor feilure.

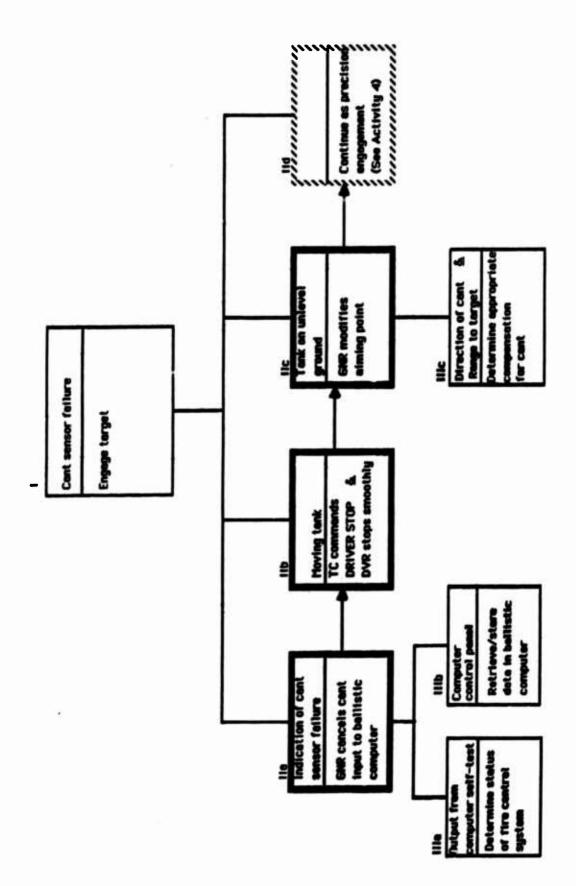


Figure E-14. Hierarchical skills analysis of Option 9.6: Engage target given court sensor foilure.

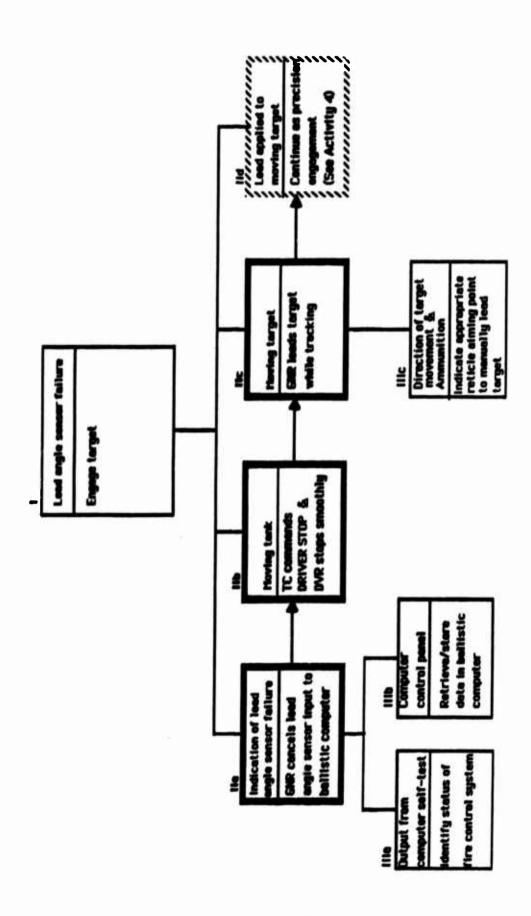


Figure E-15. Hierarchical skills analysis of Option 9.7: Engage target given lead angle sensor failure.

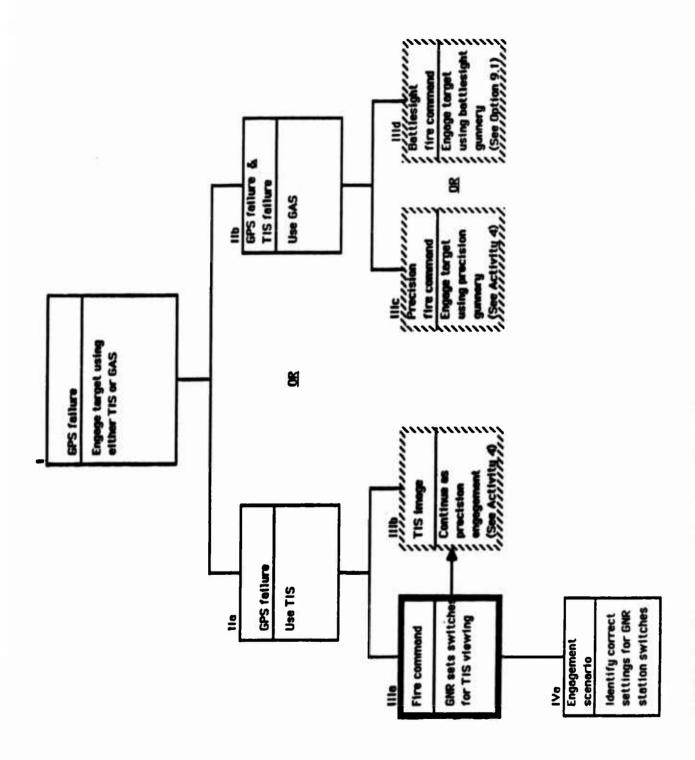


Figure E-16. Hierarchical skills analysis of Options 9.6 and 9.9. Engage target given GPS fallure.

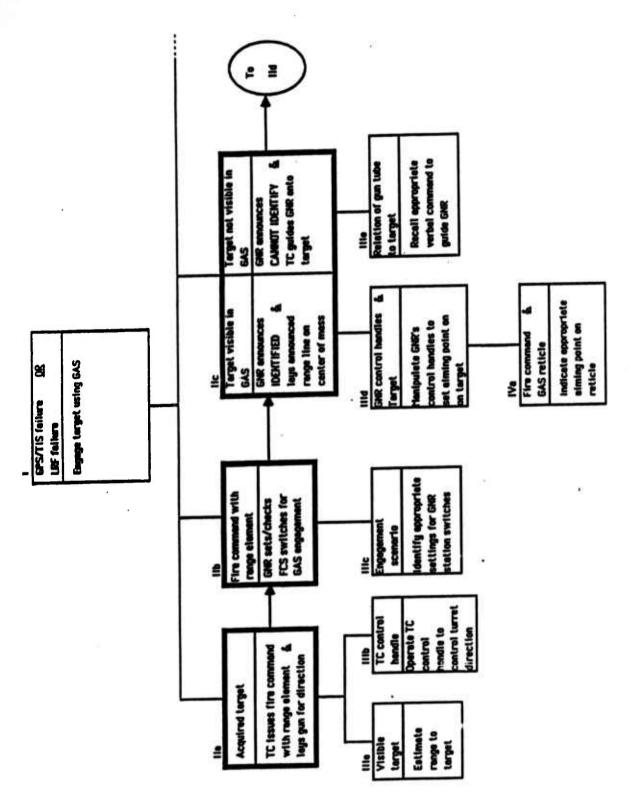


Figure E-17. Hierarchical skills analysis of Option 9.10. Engage larget using GAS.

:

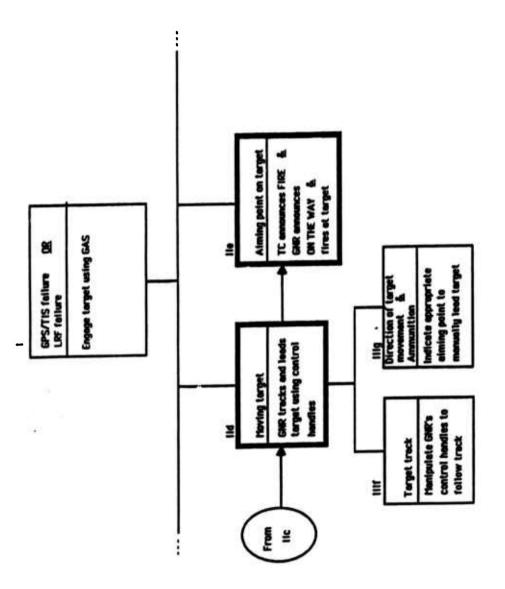


Figure E-17. Hierarchical skills analysis of Option 9.10. Engage target using GAS (cont'd).

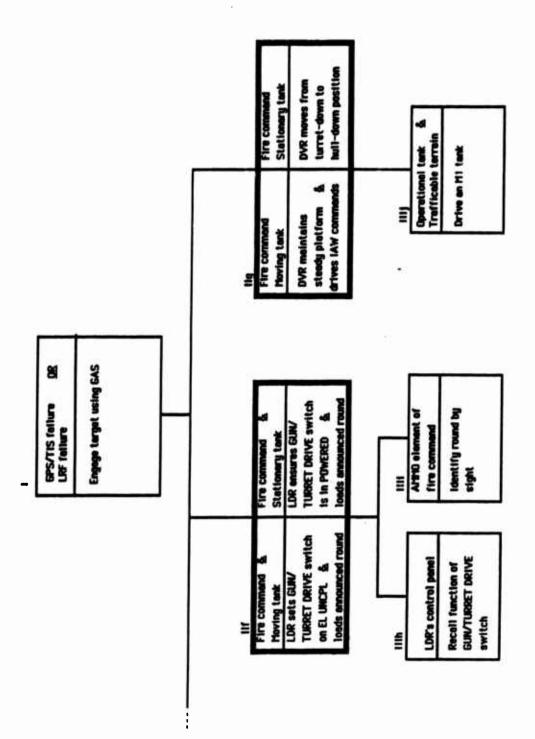


Figure E-17. Hierarchical skills analysis of Option 9.10. Engage target using GAS (cont.d).

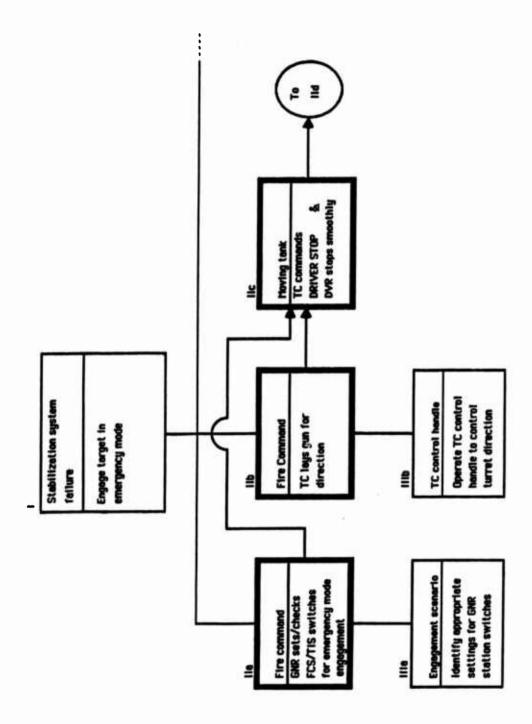


Figure E-18. Hierarchical skills analysis of Option 9.11: Engage target in emergency mode.

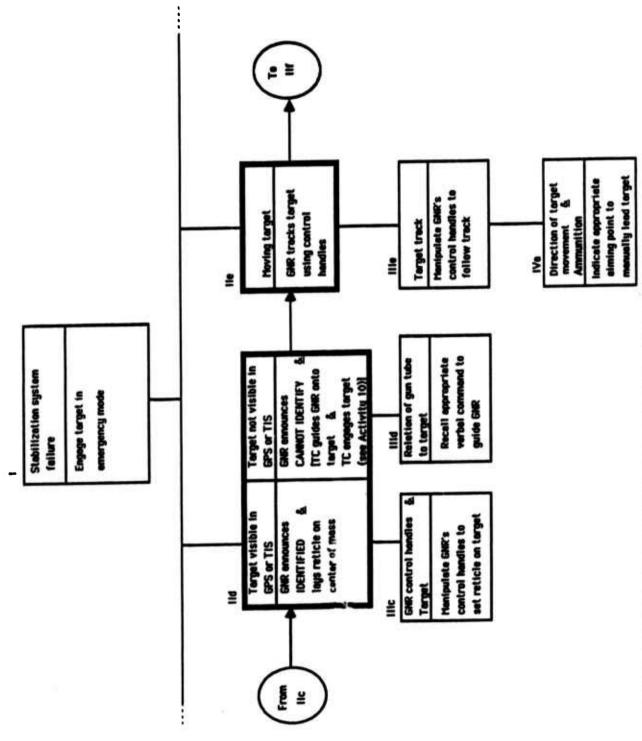


Figure E-18. Hierarchical skills analysis of Option 9.11: Engage larget in emergency mode (cont'd).

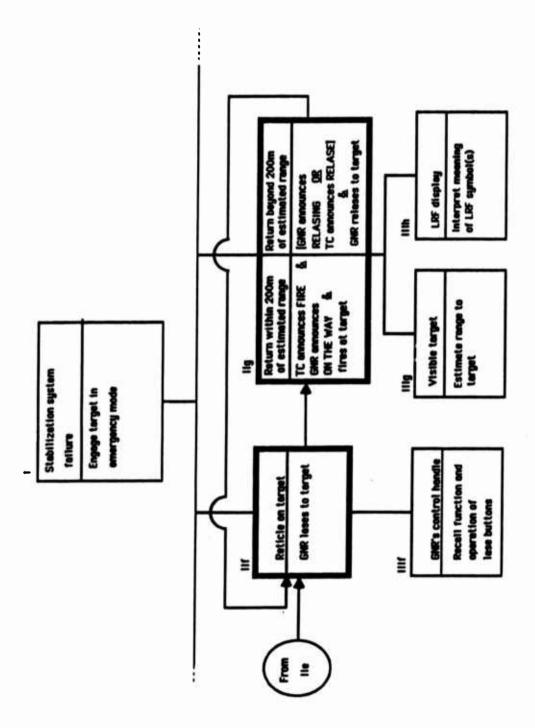


Figure E-18. Hierarchical skills analysis of Option 9.11: Engage terget in emergency mode (cont'd).

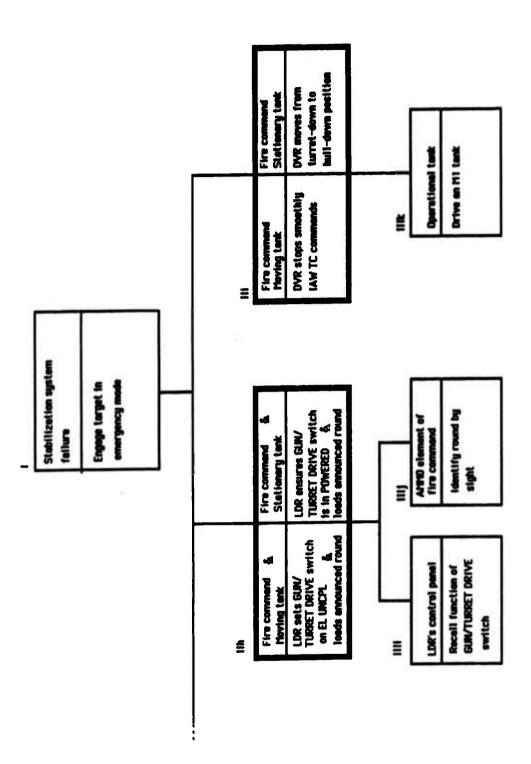


Figure E-18. Hierarchical skills analysis of Option 9.11: Engage terget in emergency mode (cont'd).

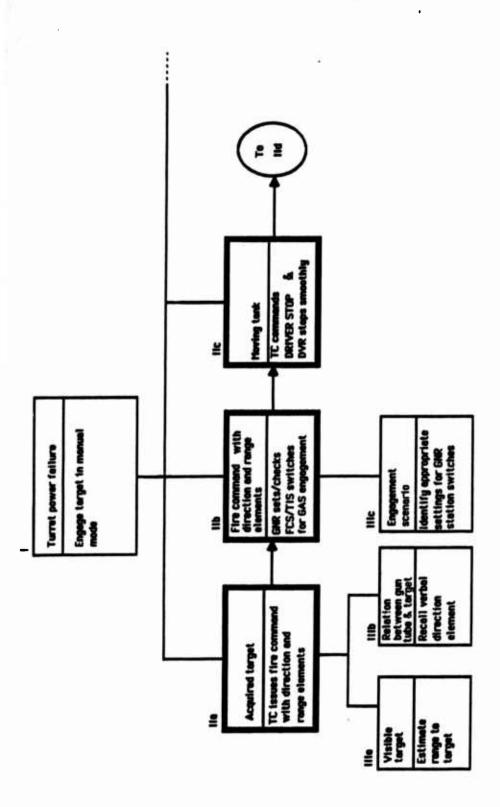


Figure E-19. Hierarchical skills enalysis of Option 9.12. Engage target in manual made.

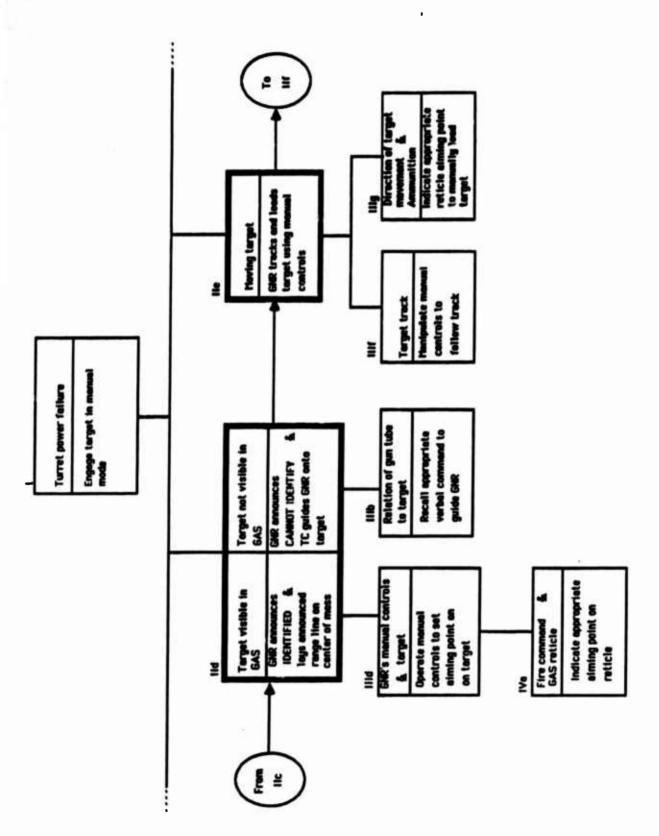


Figure E-19. Hierarchical skills analysis of Option 9.12. Engage target in menual made (cont.d).

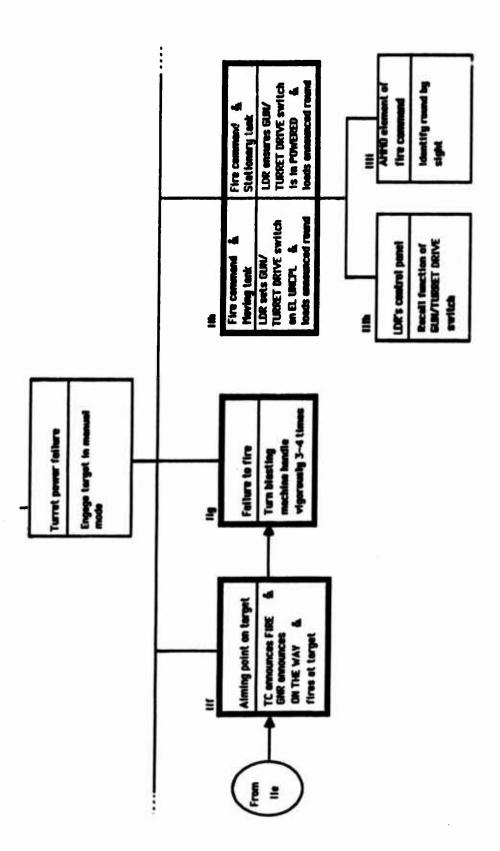


Figure E-19. Hierarchical skills analysis of Option 9.12: Engage terget in manual made (cantid).

Figure E-19. Hierarchical skills analysis of Option 9.12. Engage target in manual mode (cont'd).

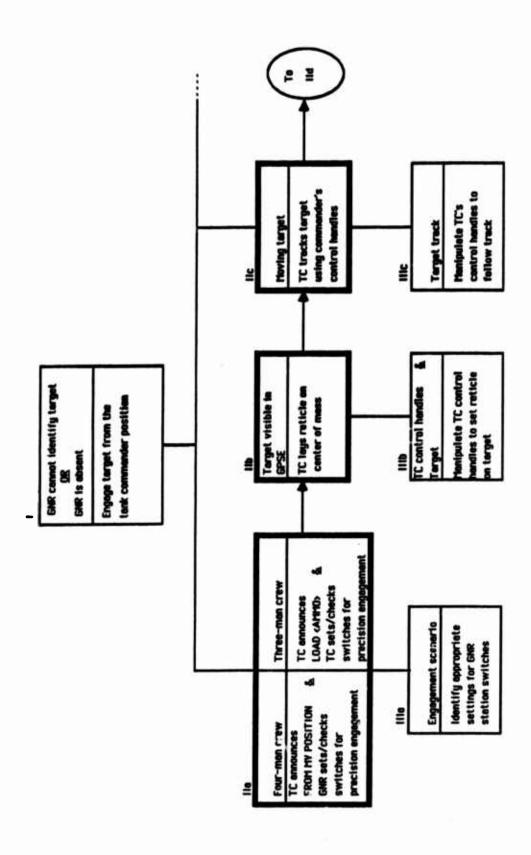


Figure E-20. Hierarchical skills analysis of Activity 10. Engage Target from TC Position.

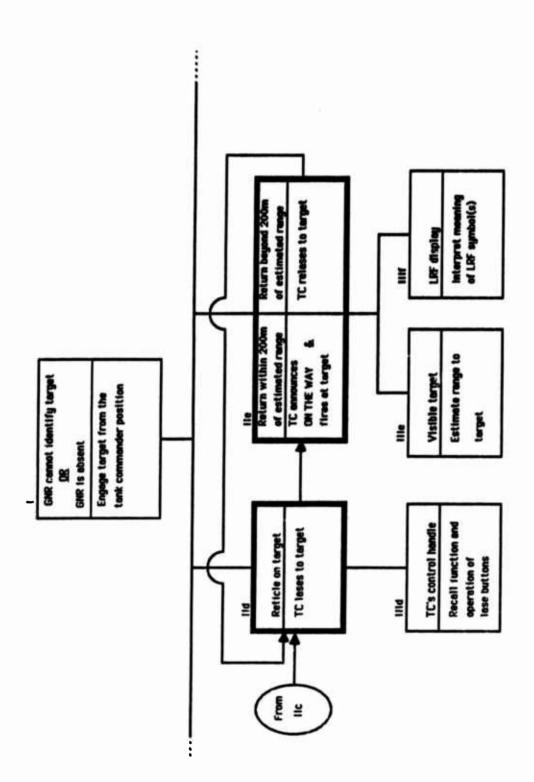


Figure E-20. Hierarchical skills analysis of Activity 10. Engage Target from TC Position (cont.d).

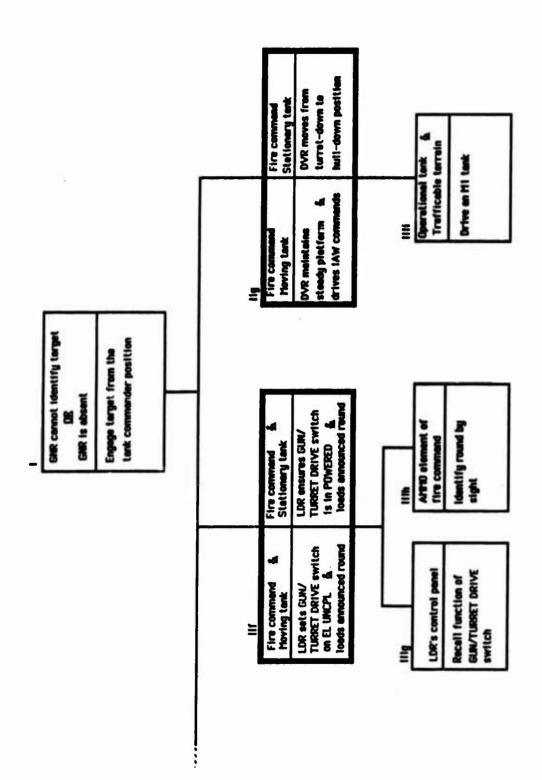


Figure E-20. Hierarchical skills analysis of Activity 10. Engage Target from TC Position (cont.d).

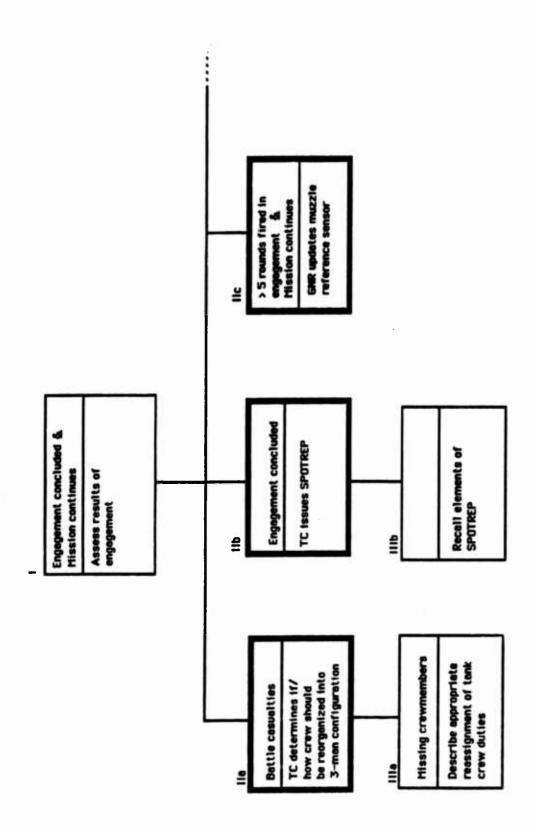


Figure E-21. Hierarchical analysis of Activity 11: Assess Results of Engagement.

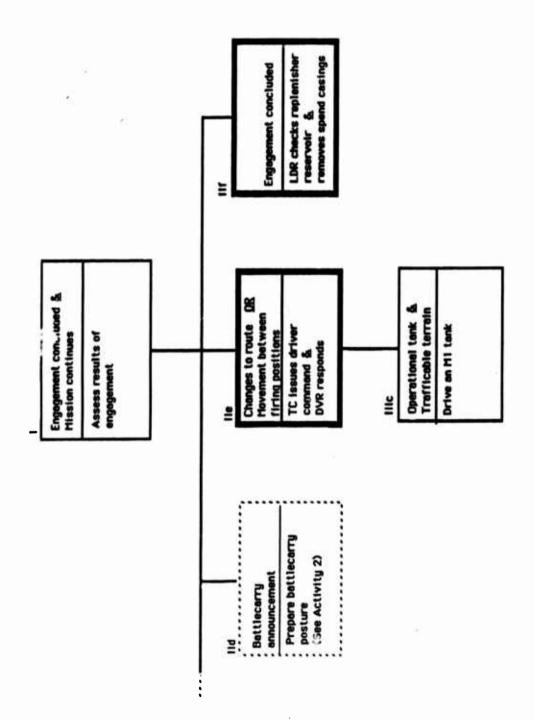


Figure E-21. Hierarchical analysis of Activity 11: Assess Results of Engagement (cont'd).

APPENDIX F ANALYSIS OF DEVICE CONDITIONS

APPENDIX F
ANALYSIS OF DEVICE CONDITIONS

				rices	
Parameters	Conditions	VIGS	TopGun	U-COFT	SIMNE
1. Target Type	a. tank	Yes	Yes	Yes	Yes
3. 7	b. pers. carrier	Yes	No	Yes	Yes
	c. helicopter	No	No	Yes	No
	d. bunkers	No	No	No	No
	e. antitank	No	No	No	No
	f. truck	Yes	No	Yes	Yes
	g. troops	No	No	Yes	No
	h. aircraft	No	No	No	No
2. Target Movement	a. sta. front	Yes	Yes	Yes	Yes
	b. sta. flank	No	Yes	Yes	Yes
	c. sta. oblique	No	Yes	Yes	Yes
	d. mov. flank	Yes	Yes	Yes	Yes
	e. mov. oblique	No	Yes	Yes	Yes
	f. mov. zig-zag	Yes	Yes	Yes	Yes
	g. mov. approach	Yes	Yes	Yes	Yes
	h. mov. retreating	No	Yes	Yes	Yes
3. Target Cover/	a. fully exposed	Yes	Yes	Yes	Yes
Concealment	<pre>b. hull defilade</pre>	Yes	Yes	Yes	Yes
	c. turret defilade	No	Yes	Yes	Yes
	d. fully hidden	No	Yes	Yes	Yes
. Target Array	a. single targets	Yes	Yes	Yes	Yes
	b. mult. targets	Yes	Yes	Yes	Yes
	c. both sgl & mult	No	Yes	No	Yes
. Target	a. owntank	Yes	Yes	·Yes	Yes
Orientation	b. elsewhere	Yes	Yes	Yes	Yes
. Target Range	a. < 900 meters	Yes	No	Yes	Yes
	b. 900-1800 meters	Yes	Yes	Yes	Yes
	c. > 1800 meters	No	Yes	Yes	Yes
. Target Sector	a. forward	Yes	Yes	Yes	Yes
	b. flanks	No	Yes	No	Yes
	c. rear	No	No	No	Yes
. IFFN	a. all threat	Yes	Yes	Yes	Yes
	b. all friendly	Yes	Yes	Yes	Yes
	c. mix	No	Yes	Yes	Yes

			De	rices	
Parameters	Conditions	VIGS	TopGun	U-COFT	SIMNET
9. Enemy Activity	a. no contactb. direct firec. indirect fired. obstaclese. minefieldsf. elec c-meas	Yes No No No No	Yes Yes No No No	Yes Yes No No No	Yes Yes Yes No No
10. NBC Conditions	a. free of hazardsb. contaminated	Yes No	Yes No	Yes No	Yes No
11. Equipment Status	a. fully oper'l b. ineffective LRF c. mult rtns d. no symbols e. crswnd snr fail f. cant snr fail g. lead snr fail h. GPS fail i. GPS/TIS fail j. stab fail k. turret pwr fail	Yes No No No No No No No	Yes No No No No No Yes No	Yes Yes Yes No No No No Yes Yes Yes	Yes No Yes No No No No No No
12. Number of Crewmen	a. four b. three	Yes No	Yes No	Yes Yes	Yes Yes
13. Supply Shortages	a. none b. ammo c. fuel d. food	Yes Yes No No	Yes Yes No No	Yes No No No	Yes Yes Yes No
14. Mission	a. offense (moving)b. defense (st'ry)	No No	No No	Yes No	Yes No
15. Fire Control	a. single tank b. frontal (sc'n) c. cross (sc'n) d. depth (sc'n) e. frontal (pltn) f. cross (pltn) g. depth (sc'n)	Yes No No No No No	Yes No No No No No	Yes No No No No No	Yes Yes Yes Yes Yes Yes

		Vontage	De	vices	
Parameters	Conditions	VIGS	TopGun	U-COFT	SIMNET
16. Movement	a. column	No	No	No	Yes
Formation	b. echelon lft/rt	No	No	No	Yes
I OI Mat I OII	c. stgr'd column	No	No	No	Yes
	d. line	No	No	No	Yes
	e. wedge	No	No	No	Yes
	f. Herringbone	No	No	No	Yes
	g. vee	No	No	No	Yes
	h. coil	No	No	No	Yes
		110			103
17. Special	a. surprise tgts	No	No	No	Yes
Engagement	b. assault fire	No	No	No	Yes
Requirements	c. support by fire	No	No	No	Yes
	or support by the				10.5
18. Space	a. spt-by-fire int	No	No	No	Yes
	b. fire & man int	No	No	No	Yes
	c. assault int	No	No	No	Yes
	d. fire pos int	No	No	No	Yes
19. Visibility	a. unlimited-day	Yes	Yes	Yes	Yes
	b. limited-day	Yes	No	Yes	Yes
	c. w/o ill-nite	No	No	No	Yes
	d. w/ill-nite	No	No	No	No
20. Terrain	a. flat	No	No	Yes	Yes
Grade		Yes	Yes	Yes	Yes
graue	b. hilly	162	162	162	162
21. Terrain	a. none	No	No	Yes	Yes
Vegetation	b. brush	Yes	No	Yes	Yes
•	c. trees	Yes	Yes	Yes	Yes

APPENDIX 6

EVALUATION OF TRAINING DEVICE FIDELITY

APPENDIX G EVALUATION OF TRAINING DEVICE FIDELITY

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APPENDIX 6-1 EVALUATION OF VIGS ON GUNNER ACTIVITIES

OH (4)	Positive Trans/Cor? Coments	1-Turret interior not represented.]-We domelight.	1-No intercom.	1-No coax.	1-80 seat.	1-"Broupads" do not adjust,	1-Chestrest not represented.	1-Related components not represented.	1-Lights work but sights don't respond correctly.	1-Drift knobs dom't wort/GPS eyepiece doesm't adjust.	1-CD not represented.	1-CC mot represented. 2-THU REAT & FAULT lights not represented. 2-STHBOLS brightness not represented. 2-STHBOLS brightness not represented. 2-GPS THERMY ballistic door not represented. 2-GPS THERMY MEMITICATION lever not represented. 2-FOCUS knob not represented. 2-FOCUS knob not represented. 2-FOCUS knob not represented. 3-For day empewents, FLITACLEMASHIR in SHTR Will give no image. 3-For day empewents, FLITACLEMASHIR in SHTR Will give no image. 3-For day empewents, FLITACLEMASHIR in SHTR Will give a green tint to day picture. 3-On ANI thermal disk, images are set for white hot; black hot setting makes image difficult/impossible to interpret.	NO 4-Too many faconsistencies with actual equipment.	1-645 not represented.	3-Turret Camos be Taily traversed. YES 2-FIRE CONTROL HODE switch wat represented.	
Provide Coment 1f Response Is NO	S S S												İ	01		011 011	
Provid	Perform/ Practice?	2	2	8	2	8	9	9	9	2	9	9	9	SE SE	2	Ş	
	ACTIVITY 1. PREPARE STATIONS FOR OPENATION	Enter gumer station	Operate domelight	Operate intercom	Install coax	Adjust seats	Adjust brompads	Adjust chestrest	Power up station	Perform GPS function check	Adjust GPS	Perform computer self-test	Perform computer data check	Perform TTS check	Perform GAS adjust	Check power control handles	

		Coments						
				4-No observable reticle movement.	1-No firing circuit tester.	1-No crosswind sensor.	1-No hydraulic pressure gage.	
ie Is 100	Posttive	Trens/Cor?						
Provide Coment of Response Is NO	Perform Every S-R							
Provide	Perform/	Practice? E		2	9	2	₽	
	Activity 1. MEDME STATIONS		(cont.d)	Perform lead system check	Perform firing circuits check	Perform crosswind sensor check	Perform hydraulic pressure check	

Comments	1-No boresight knobs. No CCP.	1-No coex.		1-All thermal disk retains and prints out indexed aumo for each round fired.	1-86 003.		1-No time to inspect terrain.	1-to 64S.	1-Ho time to learn TMPs.	
se Is NO (4) Positive Trans/Cor?			2	5		a				
Provide Comment if Response Is NO (1) (2) (3) (4) Perform/ Every S-R Posti Proctice? Element? Same? Irans/	2	Q	TES TES TES	TES TES TES	9	TES TES TES	F	02	8	
Activity 2. PEPONN PREPARE- TO-FINE CHECKS	Boresight main gun	Zero coux	Report weapon status	Index bettlecerry ammo on APPD SEL switch	Introduce battlesight range into CCP	Option 2.1. Propere for Offense Receive TC briefing YES	Option 2.2. Prepare for Defense Inspect terrain through GPS/TIS GPS/TIS	Check 645 clearance	Learn TRP locations/ranges	

	Coments				1-No magnification lever.	. Ye + tme for searching.	1-Exercises are eight day or thermal; students cannot use both channels in a particular exercise.	1-Ho time for searching.		1-No time for searching.		1-Engagement starts after fire commend.	1-Engagement starts after fire comand.	1-Engagement starts after fire command.	1-Engagement starts, after fire command.	1-Engagement starts after fire commend.	1-Engagement starts after fire command.	3-Clarity of videodisc image varies; however, some range cues are actually quite good.
e 1s 10	Positive Trans/Cor?													A				<u></u>
Provide Coment 17 Response Is NO	Every																	VES 100
Provid	Perform/ Practice?			h viewing	8	9	9	9		2	netry	9	2	9	2	2	2	SZ.
	Activity 3. ACQUINE TANGET(S)	Part 3.1 Search	Option 3.1.1. Open Hatch - Day	VIGS does not simulate open-hatch viewing Option 3.1.2. Closed Natch - Day	Select GPS/TIS magnification	Search on gun axis using GPS	Alternate using GPS with TIS	Execute search techniques	Option 3.1.2. Hight	Search on gun axis using TIS	Part 3.2. Detection/Lacation/Identify	Detect target(s)/signature(s)/ obstacles	Locate target(s)	Identify target(s) by: · Iffa	· Nomenclature	If target detected, announce GUNNER REPORT, <target>, <location></location></target>	Confirm acquisition report	Estimate range to evaluate LMF return

	Ξ	(2)	(3)	(3)	
	Perform/	Every	ĭ	Positive	
Activity 3. ACQUINE TANGET(S) (cont'd)	Prectice?	E lement?	Seme?	Trans/Cor?	Coments
Part 3.3. Evaluate Situation					
No eviner actions					

	Provide	Coment	1f Response	Is NO	
	(E)	(2)	(3)	()	
7 4. ENGAGE STRELE TARGETS	Perform/	Every	7,	Positive	
WITH THE MAIN GIM	Practice? Element?	Jement?	Î	Trens/Cor?	

Option 4.1. Precision Engagement - Moving (Offense)

VIGS does not simulate ountank movement

	1-No FIRE CONTROL MODE switch.	3/4-Ho apparent effect of setting this switch; laser will fire even if in SAFE.	1-GPS MAGNIFICATION lever is painted in lox position.			3/4-On Perceptronics domo, turnet may be traversed and gan may be fired w/o depressing palm switch; may we of negative transfer.	J/4-CM ACL THATTHE GEST, THITTE CARMOE DE TERVETSED W/O DEPTESSING PAIM SWITCH DET GEN WILL TITE; MAY DE SOUTCE Of negative transfer.	1-No GAS. 1-Assures hell-down position w/no defilade blocking main gun.	1-4ssures bell-down position w/no defilade blocking main gun.			1-GPS MGNIFICATION lever is painted in 10% position.	3/4-Must continue to track after firing at target; experienced gunners may not.	3-Turne shareston of ten arrays system; tene to restring empashing behaviors. 3-Turnet hydratic motes is unrealistic.	system correct range will couse round to miss on ist round; but fifing at target causes correct range to be input subsequent rounds
		2		YES	TES	Æ	2			ZŽ.	TES		YES	9	2
		2		MES	TES	5	2			ž	TES		£	9	8
		YES		MES	YES	¥55	Ę	Ì		ĘĘ.	ÆS		Ę.	MES	ÆS
Defense	2	TES	9	TES	TES	TES	¥ES	2	9	ZĮ.	TES	₽	Ş	YES	¥5
Option 4.2. Precision Emparemnt - Defense	Set/check switches: ' FIRE CONTROL MODE: NORWAL	. LRF: ABN LAST RTN	. 65 : #	. GIM SELECT; MAIN	. NPO SELECT as announced	Sight through GPS	Grasp palm switches	Look through GAS to determine when gun clears defilade	Announce DRIVER STOP	Look through GPS	Announce IDENTIFIED	Switch GPS to 10K	Lay on center mass of target	Track moving target	Depress lase button(s)

Coments		2/4-fault symbols do not appear; may train student to ignore.		3-initial UP is provided by synthesized voices; subsequent UP's are presented on viewing screen.	3-TC" does not wait for GMR's IDENTIFIED.			3/4-Must continue tracking to hit moving target; put experienced GMR at disadvantage.				1-TC will not respond to amnouncement.		1-TC will not identify incorrectly; will not respond to GM's announcement.			3-On thermal engagements, no image on CLEAR or FLTR.	1-GPS HAGNIFICATION lever is painted in 10% position.
(4) Positive Trans/Cor?	Æ	2	TES	9	9	TES	MES	9							1	35	ÆS	
17 Respon	WES WES	TES TES	TES TES	TES TES	MS MS	TES TES	TES TES	YES NO		lzet Lzet						YES YES	YES NO	
Provide Coment (1) (2) Perform Every Practice? Element	TES	5	TES	TES	YES	TES	TES	TES	•	smounced ta		2		₽	•	ÆS	£5	8
Activity 4. ENGAGE STHOLE TANGETS WITH THE MAIN GAN (cont'd)	Evaluate range display	Check ready-to-fire and famile symbols	Make control lay	Listen for UP	Listen for FIRE	Announce OR THE MAY	Squeeze trigger(s)	Continue tracking		Option 4.3. Gunner cannot identify announced target	Case 4.3.A.	Announce CAMMOT IDENTIFY or does not respond	Case 4.3.B.	INDUNCE IDENTIFY -DIFFERENT TARGET>	Option 4.4. Use TIS	Same as Options 1-2 with alternate switch settings: THERMAL MODE: ON	. FLTR/CLEAR/SHTR: SHTR	. THERMAL MIGHETCATION: 3K to 10K

			Coments		2/3/4-Unlike actual TIS, polarity depends on videodisc: Perceptronics TIS is best on UNITE NOT; ARI TIS is	Detter on ULMX NOT; may cause problems for experienced GMS.	YES 2-Focus ring is not represented.	
ponse Is NO	€	Positive	Trans/Cor?		1	2	TES	
If Respon	(3)	~ ~	Same?		1	2	3	
e Coment	(2)	Every	Element?		1	TES INO	NO YES	
Provid	(2) (1)	Perfora/	Practice		ş	2	ŽŽ.	
		Activity 4. ENGAGE STINGLE TANGETS	WITH THE MAIN GAM	(cout.d)	. POLARITY SATTCH: MAITE	or make not, as oestred	· SENSITIVITY, CONTRAST, and FOCUS for best image	

		2/3-Sight picture is not list, i.e., no receil. 3-No obscuration effects. 3-Other effects of firing (smell, smoke, etc.) are not simulated. 4-Expected transfer is nil.	3-Bursts are cartoomish and of uniform size. 3-Giltch in ARI thermal videodisc provides two bursts. 4-Zero transfer because bursts are difficult to interpret.			3/4-Releasing/reengaging palm switches has no effect on outcome.	REMAINDER OF ENGAGENENT SAME AS PRECISION
ie Is 110	(4) Positive Trans/Cor?	9	9		YES	2	EPATINDER OF EI
Provide Comment if Response Is NO	e I J	2	9		Ę.	2	
e Comment	(2) Every	8	Ę		ves ves ves	ž	•
Provid	(1) (2) (3) Perform/ Every S-R Practice? Element? Same?	ž	YES YES NO		MS	\$2	
	Activity S. ADJUST FIRE	Recover sight picture	Observe/announce round effects	Option 5.1. Reengage	Announce REENGAGING	Release/reengage palm switches	

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Option 5.2. Standard Adjustment					
Observe/announce deflection and range error	£5	YES NO NO	2	Ž	2/3-There are no degrade mode exercises to cue gunner to use standard adjustment
Release/reengage palm switches	TES TES NO	TES	2	8	3/4-Releasing/reengaging palm switches has no effect on outcome.
Adjust 1 mil deflection	Æ	YES YES NO	2	9	3/4-Standard adjustment will cause a miss.
Adjust 200 meters range	YES	YES YES IND	2	2	3/4-Standard adjustment will cause a miss.

---- REMAINDER OF ENGAGNERT SAVE AS PRECISION ----

Option 5.3. TC Adjustment

VIGS does not provide TC station nor simulate TC adjustments.

---- REMAINDER OF ENGAGENENT SAME AS PRECISION ----

Previde Coment if Response Is NO	Positive Trans/Cor? Coments	1-No FIRE CONTROL HODE SWITCH.	NO 3/4-No effect of setting this switch; LNF will fire in any position, even SAFE.	1-GPS MAGNIFICATION is painted in 10% position.	3/4-On Perceptronics demo, turnet may be traversed and gun may be fired w/o depressing palm switch; may be source of negative transfer.	JA-UN MAI INSTITUT 038, MITTEL CAMMOL DE L'ENVEISEN M/O GENTESSING PAIM SMILEN DEL GEN WITT TITE; MAY DE SOUVE OF REGALTVE L'ENSTET.	YES	1-GPS MACHIFICATION is painted in 10K position.	VES 3-Cadillac is too sensitive.	WO 3/4-Errors in lasing.	TES .	YES	ms .	2-No area targets, e.g., troops. 2-Targets cannot be "suppressed." YES 3-Trecers are not clearly visible; makes VIGS task more difficult than Mi. 2-Effects of MG fire (sante, blower) not represented.	VES 3-Tracers are not clearly visible; makes VIGS task more difficult than Mi.
nt 1f Resp	2 % 2 G		2		TES	2	¥2		æ	2	Ē	ĬŢ.	TŽ.	2	9
10e Come	Every Every Element?	- 1	Ę,		Ž	Ž,	YCS		T.	ā	Ď	ħ	Ä	2	2
ě.	Perform/ Practice?	2	Æ	¥\$	3	£	ÆS	2	ÆS	TŞ.	ž.	5	Ę	Ž	TES
	Activity 6. ENGAGE A STRIBLE TAKET WITH THE COAT	Set/check switches: * FINE CONTROL HODE: NORMAL	. LIFF: ARM LST RTH		. GIN SELECT: COAX	Grasp palm switches	Announce 10ENTIFIED	Switch GPS to 10X	Lay center of mass	Depress lase betton(s)	Evaluate range display	Listen for FIRE	Assounce ON THE MAY	fire 20-30 round burst (5-6 tracers) to destroy/ suppress point/area targets	

Comments		3/4-Releasing/reengaging palm switches has no effect on outcome.		
Provide Comment if Response is NO (1) (2) (3) (4) Perform Every S-R Positive Practice Element Same Trans/Cor?		2		
(3) S-R Same?		2		
(2) Every Element?		YES YES HO		
(1) Perfora	월	ž		
Activity 7. ENGAG HALTIPLE TANGETS MITH THE MAIN GAN	Empage first target using precision gummery (Option 4.1 or 4.2)	If first target is not destroyed, adjust fire as described in Activity 5	Engage second target using precision gumnery (Option 4.1 or 4.2)	

VIGS does not provide for similation of cal .50 or TC station. Therefore it cannot support similtaneous engagements.

	Coments		1-No FIRE CONTROL NOTE switch.	3/4-No apparent effect of setting this switch; laser will fire even if in SAFE.	1-GPS MAGNIFICATION lever is painted in lox position.			3/4-Ranges to target on ARI thermal disk (as indicated by LRF) are too short for battlesight techniques.										
15 110	(4) Positive Trans/Cor?			01		YES	ž	9										
ant fi	(2) (3) Every S-R Element? Same? T	Jumery		YES NO		NES NES	YES YES	YES NO						뎔			į	
Provid	(1) Perform/ Practice?	attlesight	2	YES	9	YES	Ē	ÆS		. 156.	•	ator ber	uras.	of symbolo	bology.		ensor fallu	•
	ACTIVITY 9. BIBARE TANGETS USING DEGADED GAMERY TECHNIQUES	Option 9.1. Engage targets using battlesight gunnery	Set/check switches: ' FIRE CONTROL MODE: MODBALL	. LNF: SAFE	# :5 ·	. GUN SELECT: MAIN	. APD SELECT: battlecarry amo	Engage target using pracision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target	Option 9.2. Ineffective LRF	VIGS does not similate imeffective LMF.		Option 9.3. Multiple return indicator bar	VIGS does not present multiple returns.	Option 9.4. No range display (loss of symbology)	VIGS does not simulate loss of symbology.	Option 9.5. Crosswind sensor failure	VIGS does not simulate crosswind sensor failure.	

Coments														
Activity 9. ENGACE TABGETS USING (1) (2) (3) (4) DECAMOED GAMENT Perform/ Every S-A Positive TECHNIQUES Practice? Element? Same? Trans/Cor?	Option 9.6. Cant sensor fallure	VIGS does not simulate cant sensor failure.	Option 9.7. Lead angle sensor failure	VIGS does not simulate lead angle sensor fallure.	UPGS does not simulate GPS failure.	Option 9.9. GPS/TIS failure	VIGS does not simulate GPS/TIS failure.	Obtion 9.10. GAS ownery	VIGS does not simulate EAS gunnery.	Option 9.11. Emergency mode	VIGS does not simulate stab failure; leading target will result in miss.	Option 9.12. Turret power failure	VIGS does not simmlate turret power failure; no manual controls.	

Coments		1		Comments	presented.	3/4/5-No ammo given by TC.	
(4) Pesitive Trans/Cor?			e Is NO	(4) Positive Trans/Cor?	1-CC not represented.	NO 3/4/5-No am	YES
Vide Comments if Respo (2) (3) V Every S-R Element? Same?			ovide Comment if Respo	(1) (2) (3) Perform/ Every S-R Practice? Element? Same?		YES NO NO	YES YES YES
Activity 10. ENGAGE TANGET FROM Perform TC POSITION PRACTIC	VIES does not provide TC position.			Activity 11. ASSESS RESULTS Perior Discussion of ENGAGREIT Pro-	Check/adjust MRS	Index battlecarry amo	Amounce <4000> INDEXED Y

APPENDIX 6-2 EVALUATION OF TOPGUN ON GUNNER ACTIVITIES

Activity 1. PREPAGE STATIONS	(1)	Provide Comment of Respon (2) (3) form/ Every S-R	17 Respons	se Is 10 (4)	
FOR OPENATION	Practice?	_,	i j	Trans/Cor?	Coments
Enter gunner station	2				1-Turret interior not represented.
Operate domelight	2				1-No domelight.
Operate intercom	2				1-No intercom.
Install coax	2				1-Ne coax.
Adjust seats	2				1-No seet.
Adjust brompads	9				1-No browpeds.
Adjust chestrest	2		İ		1-No chestrest.
Power up station	2				1-Related components not represented.
Perform GPS function check	2				1-GMM SELECT IS ONLY SWITCH ON Fire Control Panel that is represented, and it will not be functional in initial version.
Agust GPS	8				1-Nome of the switches/hits on the Reticle Control Pamel are represented.
Perform computer self-test	2				1-CCP not represented.
Perform computer data check	9	ļ			1-CC not represented.
Perfora 715 check	9				I-UNIY INCOME, MULE SATICA, FULMENT SATICA, and PMGNIFICATION SATECTORS are represented. I-TIS sight is activated by a sight toggle switch which is not in tank, or is autoselected by software.
Perform GAS adjust	9				1-No GAS adjust controls.
Check power control handles	£3	2	2	TES	2-3 INC. LANIMAL Mode Switch NOT Typesented. 3-62M SELECT switch does not function.
Check manual elevation/traverse cranks	2				1-No manuel controls.
Perform lead system check	2				4-No observable reticle movement.
Perform firing circuits check	2				1-No firing circuit tester.
Perform crosswind sensor check	2				1-No crosswind sensor.
Perform hydraulic pressure check	2				1-No hydraulic pressure gage.

Coments	1-No boresight knobs. 1-No CCP.	1-Но сови.		1-No NOO SELECT SWITCH.	1-No COP.			1-No time to inspect terrain.	1-No GAS.	1-No time to learn TMPs.	
(4) Positive Trens/Cor?			YES			1 15	•				
17 Respons			MES			75					
Provide Coment 1f Respondence (2) (3) orn/ Every 5-R ities Element? Same?			YES			755					
(1) Perforal	2	2	TES	2	9	3		2	2	2	
Activity 2. PERCON MENNE- TO-FTR CIECUS	Boresight main gun	Zero coax	Report weapon , tatus .	Index battlecarry amo on APPO SEL switch	Introduce bettlesight range into CDP	Receive TC briefing	Option 2.2. Prepare for Defense	Inspect terrain through GPS/TIS GPS/TIS	Check GAS clearence	Learn TRP locations/ranges	

	ε,	8	€:	3	
Activity 3. ACQUIRE TANKET(S)	Practice?	E lement?	Z Z	Trems/Cort	Coments
Part 3.1 Search					
Option 3.1.1. Open Hatch - Day					
TopGun does not similate open-hatch viewing.	tch viewing.				
			•		
Option 3.1.2. Closed Natch - Day					
Select GPS/TIS magnification	TES	Ę	žį.	ÆS	
Search on gun axis using GPS	TES	Ş	Ę	£	
Alternate using GPS with TIS	52	Ĭ,	Q	9	3/4-Toggle switch is used to select GPS, TIS, or GAS; expected transfer is nil.
					2/3-Terrain not varied. 2/3-No air targets. 4-Top-dom wide field of view, which is not available in MI, is used to search for targets;
Execute search techniques	1	2	2	1	perle
Option 3.1.3. Hight		• • • •	•	•	
Search on gun axis using TIS	MES.	ž	TES	ÆS	
Part 3.2. Detaction/Lecation/Identify	atify				
Detect target(s)/signature(s)/ obstacles	TES	2	2	2	2/3/4-Only target signature is gan flash; expected transfer is mil.
Locate target(s)	TES	MES	YES	YES	
Identify target(s) by: . IFFW	<u>Q</u>				1-All targets are threats.
* Momentature	2				1-Only one threat target: TG2.

Activity 3. ACQUIRE TANGET(S) If target detacted, announce GUNNER REPORT, <targets, <10cations<="" th=""><th>(1) Perforal Practice?</th><th>Provide Comment if Respons (1) (2) (3) Perform/ Every 5-R Practice! Element? Same? YES YES NO</th><th>f Response (3) S-R Same?</th><th>se is ND (4) Positive Trans/Cor?</th><th>Comments 3/4-Since there is no IC, behavior would normally not occur; consequently, expected transfer is mil.</th></targets,>	(1) Perforal Practice?	Provide Comment if Respons (1) (2) (3) Perform/ Every 5-R Practice! Element? Same? YES YES NO	f Response (3) S-R Same?	se is ND (4) Positive Trans/Cor?	Comments 3/4-Since there is no IC, behavior would normally not occur; consequently, expected transfer is mil.
Confirm acquisition report	₽				1-No other creams to provide acquisition report.
Estimate range to evaluate UR return YES YES NO	YES	YES YES NO	2	2	3/4-Range cies from CNT display are substantially different from real-world cies.
Part 3.3. Evaluate Situation					

No gunner actions specified

Activity 4. BIGAGE STROLE TANGETS WITH THE WAIR GIR	Perform Every Practice? Element?	티	e a ĝ	Positive Trans/Cor?	Comments
The Can done and coming and an amount	- Roving C	Trense			
Option 4.2. Precision Engagement - Defense	- Defense				
Set/check switches: - FIRE CONTROL HODE: HOWAL	2				1-No FIRE CONTROL MODE switch,
. LIPE: ABH LAST RTH	52	Ē	E S	Ę	
. 65: H	ž.	ž	žį.	TES .	
. GUR SELECT: NAIM	Ž	Ę.	9	9	3/4-Switch and indicator lamps are represented but mot-operational; zero/megative transfer is expected.
. APTO SELECT as announced	2				9/1/4/6 Jame (16.) Off dealaw winned binewilesty substitutes for all states.
Sight through GPS	Ð	2	2	9	choice of GP5/TIS/GAS is controlled by toggle switch which is not in NI tank.
Grasp palm switches	ğ	£	Ę.	ğ	
Look through GAS to determine when gun clears defilade	2				1-Assumes hall-doom position w/no defilede blocking main gen. 1-645 reticle is obtained by a topple switch.
Assounce DRIVER STOP	9				1-Assumes bull-down position w/no defilede blocking main gun.
Look through GPS	9				1-large (15") CRT display, viewed binocularly, substitutes for all sights.
Amounce IDENTIFIED	TES	£5	MES	TES	
Switch GPS to 100	TES .	MES	#S	TES	
Lay on center mass of target	YES	YES	YES	ZŽ.	
Track moving target	TES	TES.	#S	TES	
Depress lase button(s)	2	Ě	2	Ş	3/4-Software requires lase buttom press for auto lead.

Coments		2/3/4-Fault symbols are not presented.		3-Generated by computer synthesis.	3/4-Pseudo "IC" does not wait for GM's IDENTIFIED.							1-Pseudo "TC" will not respond to ennouncement.		1-Pseudo "TC" will not identify incorrectly; will not respond to announcement.		
Is NO (4) Posttive Trans/Cor?	YES	₽	YES	Ş	2	TES	TES	MES				İ				53
Provide Comment if Response Is NO .) (2) (3) (4) form/ Every S-R Postt: ctice? Element? Same? Trans	Ę	2	Ž	9	2	TES.	Ţ,	ĘŞ	•							£
Provide Comment (1) (2) Perform Every Practice? Element?	Ę	2	¥5	ŽŽ.	MES	MES	YES	MES		target					•	ž.
(1) Perfora/ Practicel	TES	Ę	TES	TES	£	TES.	£	MES		v announced		2		2		ž.
Activity 4. ENGAGE SINGLE TANGETS UTTH THE MAIN CHI (cont'd)	Evaluate range display	Check ready-to-fire and fault symbols	Make control lay	Listen for UP	Listen for FIRE	Amounce Of THE MAY	Squeeze trigger(s)	Continue tracking		Option 4.3. Ganner cannot ident."v annoanced target	Case 4,3.A.	Announce CAUNOT IDENTIFY or does not respond	Case 4.3.8.	Amounce IDENTIFY «DIFFERENT TAMET»	Option 4.4. Use TIS	Same as Options 1-2 with alternate switch settings: ThERMAL HODE: ON

		Comments				FOCUS knobs.
			1-80 FLTR/CLEAR/SHIK SWITCH.			1-No SENSITIVITY, CONTRAST, or FOCUS knobs.
t Is 10	(1) (2) (3) (4) erform/ Every S-R Positive	Trans/Cor?		žį.	MES	
if Respons	EI	See S		MS.	\$2	
de Comment	(1) (2) Perform Every	[]ement?		TES TES TES	WES WES WES	
Provi		Practice	2	TS.	£5	9
	Activity 4. ENDAE STREE TARETS	(cont'4)	. FLTA/CLEAR/SHTR: Shtr	THERMAL MAGNIFICATION: 3K to 10K	. POLARITY SHITCH: WHITE OF BLACK HOT, as desired	· SENSITIVITY, CONTRAST, and FOCUS for best image

			Coments	3-Other effects of firing (smell, smoke) are not simulated. 2/3-Sight bicture is not list. 1.s., no recoil.	4-Expected transfer is mil.					ENGAGENETIT SAME AS PRECISION
t Is 100	€	Positive	Trens/Cor?		2	YES		YES	YES	SAEDENT SWE
1f Respons	(3)	Ŧ,	Same?		9	TES		£5	2	8
Provide Comment 1f Response Is NO	(2)	Every	Element?		2	res res		TES TES TES	TES TES	•
Prov1	Ξ	Perform/	Practice? Element?		TES	YES		TES	Ş	
			Activity 5. ADJUST FIRE		Recover sight picture	Observe/announce round effects	Option 5.1. Reengage	Announce REENGAGING	Release/reengage palm switches	

---- ENGAGENERT SAME AS PRECISION ----

Option 5.3. TC Adjustment

Top Gun does not provide TC station nor simulate TC adjustments.

Comments		Coments		Commits
Activity 6. ENCAGE A SINGLE Perform (2) (3) (4) TANGET WITH THE COAX Practice? Element? Same? Trans/Cor? Top Gan does not simulate coax engagements.	Provide Coment 1f Response	TAMBETS WITH THE Perform, Every S-R Positive MAIN GIR Practice? Element? Same? Trans/Cor? Empage first target using pracision gummery (Option 4.1 or 4.2)	If first target is not destroyed, adjust fire as described in Activity 5 Engage second target using precision gunnery (Option 4.1 or 4.2)	Activity 8. ENGAGE TANGETS WITH THE CAL. 50 (1) (2) (3) (4) (INCLUDING SIMM. Perform. Every S-R Positive TAMEDNS NAIM GIM Prectice? Element? Same? Trans/Cor?

Top Gen does not provide for simulation of cal .50 or TC station. Therefore, it cannot support simultaneous empagements.

Comments						
Activity 9. ENGAGE TANGETS USING (1) (2) (3) (4) EGNACED GUNERY Perform/ Every 5-R Positive TECHNIQUES Practice? Element? Same? Trans/Cort	To does not announce battlesight engagements. Battlesight range cannot be preindezed. Therefore, Topkum does not support battlesight engagements.	Option 9.2. Engage target given ineffective LIK TopGam does not simmlate ineffective LBF.	- چا چ	Option 9.4. Enyage target given no range display (loss of symbology) Topben does not similate loss of symbology.	Option 9.5. Engage target given crosswind sensor failure. Topoun does not simulate crosswind sensor failure.	Option 9.6. Engage target given cant sensor fallure TopGun does not simulate cant sensor failure.

Comments																	
Activity 9. ENDAGE TABLETS USING (1) (2) (3) (4) DEGRADED GAMENT Perform Every S-R Positive TECHNIQUES Practice? Element? Same? Trans/Cor?	Option 9.7. Engage target given lead angle sensor failure	TopGan does not simplete lead angle sensor fallure.	Option 9.8. Engage Larget given 675 failure (day channel)	Empage target using TIS (Option 4.4)	Option 9.9. Engage target given GPS/TIS failure	Case 9.9.A. Use 645	Engage tarpets using GIS gennery (Option 9.9)	Case 9.9.B. Index estimated range and use precision genery	Open COP door IIO IIO III	Press RANGE betton IIO	Enter 40MG> 1-46 CCP.	Press ENTER button 11-No CCP.	Close CCP door 11-110 CCP.	Engage target using precision gumery (Option 4.1 or 4.2)	Case 9.9.C. Use battlestint gumery	Empage target using battlesight gunnery (Option 9.1)	

Option 9.11. Engage target given stabilization system failure (emergency mode)

TopGun does not similate stabilization system failure.

Option 9.12. Engage target given turret power failure

TopGun does not simulate turret power failure.

		Coments				Comments	1-No CCP button.	1-No AMMO SELECT switch.	1-No APPO SELECT switch.	
e Is MO	1) (2) (3) (4) 'Yorn' Every S-R Positive	irens/cor:		1	E 15 RD	Positive Trans/Cor?				
1f Respons	១៥]				Kes	E T B			2	
e Coment	(2) Every	Cleaning			Provide Coment 17 Respon	(2) Every				
Provid	(1) Perfora/	LI SCHICE	2		L ALLAN	Perform (2) Practice? Element?	2	2	9	
	Activity 10. ENGAGE TANGET FROM		Topien does not provide TC station.			Activity 11. ASSESS RESULTS OF ENCAEDENT	Check/adjust MRS	Index battlecarry aumo	Announce <amo indexed<="" th=""><th></th></amo>	

APPENDIX 6-3
EVALUATION OF U-COFT ON GUNNER ACTIVITIES

| TES IND | TES TES TES
 | |

 | \$ |
 | rcom YES NO YES 3-Footswitch does not function. | | MES MES MES MES
 | | |
 | Practice: Element? Same? Trans/Cor? | Perform Every S-R Positive |
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--|---|---|--|
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 | 75 | 155 | 10
 | 100 | 100 |
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 | (1) (2) (3) (4) Perform Every S-R Positive | (c) (c) (d) |

(4) Positive Trans/Cor? Coments	2-Pyr-Mutson device is not represented. 2-Tank cannot be on unlevel ground. 2-Breeck cannot be opened. 2-Machineguns cannot be cleared. 3-Boresight panel is exactly at 1200 m with range preindexed in the fire control system. 4-GMR practices incorrect procedure w.r.t. averaging boresight readings. 1-Cax mockup cannot be loaded. 3-Turnet blower hoise is faintly simulated through CVC only. 3-Turners" are too tishtly clustered.	4-Software "giltch" prevents machinegun strike errors from being adjusted out. 4-One shouldn't zero on boresight target.	TES	YES	TCS TO THE TOTAL THE TOTAL TO THE TOTAL TO THE TOTAL TO THE TOTAL TO THE TOTAL TO T	9		YES 3-Terrain is cartonalsh and objects are subject to misinterpretation.	FAIl defensive engagements start behind berm; no need to check. Fig. 3-All defensive engagements start behind berm; no need to check.	YES 3-Terrain is cartoonish and objects are subject to misinterpretation.
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Provide Coment 1f Respons 1) (2) (3) form, Every S-R cite? Element? Same?	2	2	ÆS	Ě		\$2		TES	¥ES	TES
Provide (1) Perform	25	YES	£	TES	£5	Ē		Ę	žį.	MES
Activity 2. PENTONI PNEPANE- TO-THE CNECKS	Boresight main gun		Report weapon status	Index battlecerry amo on APPO SEL switch	ag de	Option 2.1. Prepare for offense Receive TC briefing YES YES YES	Option 2.2. Prepare for defense	Inspect terrain through GPS/TIS	Check GAS clearance	Learn TRPs

Coments		3-Shapes/details of objects change as a function of magnification. 3-Visual scene is stylized/cartoonish.		3-Thermal image is too consistent and too good; images are too uniform.	2-Me target signatures other than flashes from direct fire. 2-imited erray of potential vehicles. 3-Obstacles have no effect on tank movement; IC cannot control movement. 4-Expected transfer is mil.		2/3-Target array is limited; consequently target ID is easier than actual task,	2/3-farget array is limited; consequently target ID is easier than actual task.
(4) (4) Pesttive Trans/Cor?		22 E	B 25	5	8	5	ž.	£
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(1) Perfora	ch viewing	5 5	B B	¥	£ 5	ž ž	Ž	žš.
Activity 3. ACQUINE TANCET(S) Part 3.1 Search Option 3.1.1. Open hatch - day	U-COFT does not simulate open-batch viewing conditions. Option 3.1.2. Closed batch - day	Select 3K GPS/TIS magnification Search on gam axis using GPS	Alternate using GPS with TIS YES Execute search techniques to acquire targets	Option 3.1.2. Hight Search on gen axis using 715	Part 3.2. Detaction/Lacation/3D/Reparting Detact target(s)/signature(s)/ obstacle(s)	Locate target(s) Identify target(s) making the following determinations: ' IFFN	. Nomenclature	If target detected, announce GUMER REPORT, <target> < OCATION</target>

	Coments		3/4-Targets appear closer than they are because distant objects are too distinct and saturated in color. 3/4-Objects are difficult to distinguish (e.g., trees - hills) making relative size judgments difficult. 3/4-Lay of land is difficult to determine. 4-Amecdotal evidence indicates that range estimation on U-CDFT may be difficult for the expert at first, but he quichly adjusts.
CA) (4)	Trans/Cor?	YES	2
17 Respons (3)	Ĩ	YES	9
(1) (2) (3) reform (4 Respon	Element?	TES TES TES	Ŕ
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	Activity 3. ACQUIRE TANCET(S) (cont'd)	Confirm target	Estimate range (approximate in YES YES NO order to evaluate LIPF return)

Part 3. Evaluate situation

No gumer actions

### ### ### ### ### ### ### ### ### ##	Activity 4. EMSAGE SINGLE TANGETS Perform/ Every WITH THE PAIM GAM Practice? Elemen Option 4.1. Precision engagement - moving (offense) Set/sheck switches: 'FIRE CONTROL MODE: WORMAL YES YES	(1) (2) (3) (4) Perform/ Every S-R Postt: Practice! Element? Some? Trans, moving (offense) YES YES YES YES	e i i	(4) Positive Trans/Cor? YES	Commuts
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Comments			4-8-COFT does not penalize GMR for arming LMF before fire command.		4-U-COFT does not penalize GMM for arming main gan before fire command.								3-Shapes/details change as a function of magnification.		3-8-COFT handles are too sensitive; real handles are "smoother."					
Is 10 (4) Positive Trees/Cor?		5	9	£	8	MS	TES	WES	EŽ.	Ð	MES	22	E	žį.	YES	YES	TES	2	TES	¥5
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Activity 4. ENCAGE SINGLE TANGETS WITH THE MAIN GAM (cont'4)	Option 4.2. Precision engagement - stationary (defense)	Set/check switches: ' File Confilo, MODE: MODEM	. LIFT: ARM LAST RTII	# Š	. GIM SELECT: MAIN	. NOO SELECT as announced	Sight through G/S	Grasp palm switches	Lock through GAS to determine when gan clears defiliade	Assesses DRIVER STOP	Lock through GPS	Assessor IDENTIFIED	Switch GPS to 1000	Lay on center mass of target	Track moving target	Depress lase button(s)	Evaluate range display	Check ready-to-fire and famile symbols	Make control lay	Listen for FIRE

Provide Comment if Response is 40 (1) (2) (3) (4) TABLETS Porforny Every S-R Positive COM Practice? Element? Same? Trans/Cor?	TES TES TES	WES WES WES	WES WES WES	Identify amounced terret		or NES NES NES		TES TES TES		sion 4.2)	YES NO YES 3-Thermal tange is too good/consistent.	YES WES HO YES 3-Thermal image is too good/consistent.	TES YES NO YES 3-Thermal tampe is too goor//consistent.	E YES YES NO YES 3-Thermal tmage is too good/consistent.	Æ
Provide Com 1) (2) form/ Ever ctice? Eleme	1	i		nounced targe		1		_1			1	1	1	.1	55 55
Activity 4. ENDINE SINGLE TANGETS Po- UNTH THE MAIN GM PTI (cont'd)	Amounce ON THE MAY	Squeeze trigger(s)	Continue tracking	Option 4.3. Gamer cannot identify annumced target	Case 4.3.A.:	Amounces CAMPIT IDENTIFY or does not respond	Case 4.3.8.:	Amounces IDENTIFY -OIFFERENT TARGET>	Option 4.4. Use 715	Engage targets using practision gumnery (Option 4.1 or 4.2) with the following alternate switch settings:	THEIRING, MODE: OIL	. FLTM/CLEAR/SHTR:	. Thenex panification: at to lax	. POLARITY SUITON: MITE or BLACK HOT, as desired	· SENSITIVITY, CONTRAST, and FOCUS for best image

Compets	2/3-Simpleted receil is too weak to cause total loss of sight picture. 2/3-Other effects of firing (smell, smoke, etc.) are not simpleted.	3-Probability of "LOST" is practically mil.				- ENGACRENT SAME AS PRECISION						ENGAGDENT SAVE AS PRECISION				ENGAÇDENT SAVE AS PRECISION	
(4) (6) Positive Trees/Cor?	MES	ST.		¥ES	Ē	ENCACDENT SAFE		45	165	TES	Ð	JAS JIJGDA		Ž	TES	MEDERIT SAFE	
	2	2		45	Ħ	1 1		22	Ş	\$2	Ş	DICK		£5	Ž	35	
(2) Every Element?	2	Ş		T.	£3			Ş	Ş	Ę	ĬŽ.	•		TES.	MS	•	
Provid (1) Perform/ Practice?	25	Ş		Ş	5			Z	Ş	Ş	Z.			Ş	Æ		
Activity 5. ADUST FIRE	Recover sight picture	Observe/amounce strike of every round	Option 5.1. Reengage	Amounce REINGAGING	Release/reengage palm switches		Option 5.2. Standard adjustment	Observe/amounce deflection and range error	Release/reengage palm switches	Adjust 1 mil deflaction	Adjust 200 meters range		Option 5.3. TC adjustment	Release/reengage palm switches	Apply TC correction		

Comments			4-8-COFT does not penalize GMR for arming LMF prior to fire command.		4-U-COTT does not penalize GMR for arming coax before fire command.									2-Targets cannot be "suppressed." 3-Personnel are represented as flashing dots. 2-Effects" of MG fire (smake, blower) and represented. 3-Tercer running are and dispersed easiesh manifes assier than MI	
Is NO (4) Positive Trens/Cor?		153	9	Ē	2	£	£	5	TES	TES.	ğ	2	Ę	5 5	
Provide Comment if Response is ID (2) (3) (4) (4		ÆS	£	Ş	£	Ę	£	£	3	£	TES.	£	Ę	2 2	
C. C. C. C. C. C. C. C. C. C. C. C. C. C		Ş	Ę	Ş	Ş	Ę	ĘŽ	£	Ş	£	Ş	Ş	Ę	2 2	
(1) Perform		ā	5	Ş	£	5	£	£	Ē	Ę	12	2	2	5 5	
Activity 6. ENGAGE A STINGLE TANGET WITH THE COM	Check/positions switches:	. FIRE CONTROL MODE:	. FIRE: WAN FRE KEEN	# Š	. OM SELECT: COM	Grasp palm autiches	Aenounce IDENTIFIED	Seritch 475 to 100	lay center of mass	Depress lase button(s)	Eveluate range display	Listen for FIRE	Amounce ON THE LAY	Fire 20-30 round burst (5-6 tracers) to destroy/suppress point area targets Adjust fire	

Coments				Coments						
1		TES TES TES		Provide Coment if Response is HO (1) (2) (3) (4) Perforny Every S-A Positive Practice? Element? Samp? Trans/Cor?				TS TS TS TS		TES TES TES
Activity 7. ENGAGE MATTIFLE TABELIS MITH THE MAIN GAN	Empage first target using procision gammary (Option 4.1 or 4.2) If first target is not destroyed,	adjust fire as described in Activity 5	Empage second target using practision gammery (Option 4.1 or 4.2)	Activity 8. EMEME TAMETS MITH THE CM59 (INCLINIUM STRM.— TAMEDUS MAIN GAN EMAMEENTS	Option 8.2. Similaneous targets	Engage main gan target using precision gamery (Option 4.1 or 4.2)	Adjust fire using gummer's standard adjustment (Option 5.2)	Amounte TANETCEASE FIRE YES	Option 6.2. Cel .50 targets	Ald in adjusting TC's weapon

Activity 9. ENGAE TANGETS USING DEGRACED GAMERY TEDUTQUES (CON'4)	Provide Comment of Response 1s ND (1) (2) (3) (4)	
Case 9.2.0. GR manually applies range		
Engage target using GAS (Option 9.10)		
Option 9.3. Engage target given miltiple returns from LIE	itiple retures from LIE	:
Depress lase button(s)	TES TES TES	1
If miltiple return symbol appears in GPS, amounce NAME <in neters<="" th=""><th>MS MS MS</th><th></th></in>	MS MS MS	
Switch LMF setting in accordance with TC instructions	WS WS WS	
Relay on target	TES TES TES TES	
Depress lase button(s)	TES TES TES TES	1
Squeeze trigger(s)	TES TES TES TES	
		:
Option 9.4. Engage target given no range display (loss of symbology)	range display (loss of symbolegy)	
U-COFT does not simulate loss of symbology	enter of the control	
		:
Option 9.5. Engage target given crosswind failure	issuind (eilure	
U-COFT does not similate crosswind sensor failure	sensor failure	
		:
Option 9.6. Engage target given cant sensor failure II-OST does not similate cant sensor failure	int sensor failure	
		•

Coments				2/3-In 8-COFT, inducing GPS failure induces TIS failure as well.										3-8-COFT does not penalize GMR for arming main gan prior to fire commend.	3-U-COFT does not penalize GMR for arming main gan prior to fire command.				3/4-Software error causes fell of round to disagree with range as announced by 1/0 (Witmer).
(4) Positive Trans/Cor?												ā	TES	ž.	ž	£	T.	¥5	2
Provide Comment if Response Is NO (1) (2) (3) (4) (4) (4)		¥			•							2	TES	5	Ž	TES	T.S	TES	2
Commit Every Element?		Independe								•		5	TES	Ę	Ę	£	£5	TES	455
(1) Perforal	=	oor fallers	: គ	2	PS/TIS failure			techn lques			뾔	Ş	£5	£	Ē	ž.	Ę	£S	25
Activity 9. ENGAGE TANGETS USING DEGNADED GRANELY TECHNOMES (cont'd)	Option 9.7. Lead angle sensor failure	M-COFT does not similate lead sensor failure independent of stab failure	Option 9.8. GPS Failure (Day Channel)	Engage target using TIS (Option 4.4)	Option 9.9. Engage target gives GPS/TIS failure	Case 9.9.A.	Engage targets using GAS gunnery (Option 9.9)	Case 9.9.8. Use GAS battlesight techniques	Empage target using battlesight gummery (Option 9.1) but with GAS instead of GPS		Option 9.9. Engage target using GAS	Set/check artiches: FINE CONTROL MODE: NORMAL	345 :311 .	. GOM SELECT: MAIN	. NAMO SELECT:	Sight through GAS	Grasp palm switches	Amounce 10EHTJF1ED	Lay amounced range line on Larget

Coments						ब		4-U-CAST does not penalize GMR for arming laser prior to fire command.		4-U-COFT does not penalize GM for araing main gan prior to fire command.	4-C-COFT does not penalize GM for arming main gun prior to fire command.									
(4) Positive Trees/Co	£	£	TES	TES	Ð	, see a see	Ð	2	TES	2	5	Ę	52	2	ā	ž.	Ť	T.S	5	
Provide Comment if Response is NO (1) (2) (3) (4) Perform Every S-R Positive Practice? Element? Same? Trans/Cor?	Ş	Ð	TES.	ÆS	Ş	fellure (e	Ş	£5	YES	TES	ē	TES	MES	TES	ħ	Ę	455	MS.	45	
Every Every	ş	EŽ.	2	ş	2	ion system failury	5	Ž	Ā	Ş	Ē	TES.	TS.	ŽĮ.	ā	ŽĮ.	TES	T.S	ş	
(1) Perform	ē	100	2	₽	2	stabilizatio	£3	2	2	Ē	ā	£	15	5	ā	TES	Æ	MES	2	
Activity 9, ENCAGE TANGETS USING DERANDED GAMMENT TEDMIQUES (cont'd)	Lead moving target	Listen for fill	Amounce Of THE MAY	Squeeze trigger(s)	Continue tracking	Option 9.11. Empage target given stabilization system failure (emergency mode)	Set/chack switches: ' FINE CONTING, MODE: DEDRENCY YES	. LIFE: ANY LAST RTIE	# 35 9 .	. GUN SELECT: MAIN	. APP SELECT:	Sight through GPS	Grasp palm switches	Amounce IDENTIFIED	If target is moving, apply lead	Listen for FIRE	Amounce Of The WAY	Squeeze trigger(s)	Continue tracting	

Comments			4-U-COFT does not penalize GM for arming main gan before fire command.	4-8-COT does not penalize GME for arming unin gan before fire command.		3-Traverse resistance too light/maiform.		3/4-Software error causes fell of round to disagree with range as announced by 1/0 (Witner).	3/4-Software error causes fall of round to disagree with range as announced by 1/0 (Witner).					
(4) Positive Trees/Cor?	Ę	Ş	2	£	M.S	Ş	TES.	9	£	Ę	Ş	Ş	5	
Provide Comment of Response 15 NO (2) (3) (4) (4) (4) (4) (5) (5) (5) (5) (1) (5) (5) (5) (5) (5) (5) (5) (5) (5) (5	žž	Ę	Ę	ğ	TES	9	£	2	£	13	Ē	ā	25	
(2) Every Every Clament?	Ð	Ş	ħ	ā	Ę	ā	Ş	Ş	Ş	Ş	52	Ş	Ş	
(1) Perform Practice?	ž.	Ş	123	Ē	1	2	E .	£	ğ	2	Ž,	ħ	¥	
Activity 9. ENGAGE TRACETS USING (1) DECRACE COMMENT (1) TECHNOLOGY CONT'S (1) TECHNOLOGY CONT'S (1) TECHNOLOGY CONT'S (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1) TECHNOLOGY (1)	Set/check suffiches: ' FINE CONTROL MODE: NAMEAL	× Š	. GUN SELECT: MAIN	. APO SELECT:	Sight through GAS	Treversa/elevate ulth manual controls	Amounce IDENTIFIED	Lay amounced range line on target MS	If target is moving, apply load	Listen for FIRE	Assemble OII THE MAY	Press elevation knob firing trigger	If gen fails to fire, vigorously turn blasting mechine handle 3-4 times	

Coments											Coments	2-AUX PAR is not an option; "engine" is always CM. 3-Gan movements resulting from MES update are not simulated.			
15 10 (4) Positive Trees/Cor?		P	£	165	TES	TES	£2			9	(4) Positive Trans/Cort	#2 %	£	£	
E 2 2		£	ES.	Ę	Ę	Ę.	Ş			// Beannage		2	Ę	Ě	
C C C C C C C C C C C C C C C C C C C		£5	£	ě	E.	Ð	Ę	5		Provide Comment 17 Beaus	C (Second	2	£	Ş	
(3) Processor		5	Ş	Ę,	2	ĕ	ě			, and a	(1) Practical	ā	Ş	£\$	
Activity 10. EHONEE TANGET FROM TC POSITION	(TC perform these behaviors in 3-mm engagements)	Set/check suitches: ' Fine confino, MOE: MORW.	. TIS: STBY/ON	. LIF: API LIST RTI	. 63: 100	. ON SELECT: NAM	. APD SELECT: as announced				Activity 11. ASSESS RESULTS OF ENGAGNET	Check/adjust MS	Index battlecarry amo	Amounce <490> INCKED	

APPENDIX 6-4 EVALUATION OF STHEET ON GUMER ACTIVITIES

	Provide	Provide Coment 17 Respon		01 51	
ACTIVITY 1. PIEPME STATIONS FOR OPENATION	Perfora/ Prectice?		Į K	Pasitive Trens/Cor?	Compats
Enter gunner station	2				1-Enter SIMET through door at side of crew compartment.
Operate domelight	Ž,	2	9	173	2/3-mo red filter on compilight. 2-Damelight does not go completely off.
Operate Intercom	ā	£	8	165	J-masset/boom ming are ased instead of LVC meller. J-Macker switch on cable substitutes for J-position switch on belief.
Install coax	2				1-the cear.
Mjest souts	2			-	1-CRR seat does not ediust.
Albest brampads	2				1-075 brompets do not adjust.
Aftest chestrest	2				1-No chestrest. 2-PMEL LIGHTS TEST button and adjust knob are painted on.
					2-CCT to pointed controls are painted on with the DERMAL MODE switch pointed in the OFF position. 2-No between controls are painted on with the DERMAL MODE switch pointed in the OFF position. 2-No main gan travel and turnet traverse locks are not represented. 3-No MMIML indicator light of the FIME CONTROL MODE switch is painted on.
Power up GM station	ħ	2	2	2	4-Meet of the components associated with this procedure are missing or are nonfunctioning; expected transfer is mil.
					2-to DEFINITE suitch on indicator light. 2-to GPS ballistic dears. 2-fLTA/QLE/AV/SHTE suitch is pointed in the CLEAR position. 2-fLTA/QLE/AV/SHTE suitch is pointed in the CLEAR position. 3-MANUAL indicator light of the FINE CONTROL NOTE suitch is pointed on. 3-COAK indicator light of the GNN SELECT suitch is pointed on. 3-BN and NEP indicator lights of the APRONITION SELECT suitch are pointed on.
Perform GPS function check	TS.	2	2	2	d-remay of the components associated with this procedure are missing or monfusctioning; expected transfer is mil.
Myst OS	2				1-473 cummon be focused. 1-Apticle drift does not exist and cannot be adjusted.
Perform computer self-test	2				1-CCP door is painted closed.
Perfore computer data check	Q				1-CCP door is painted closed.
Perfora TIS check	2				1-115 does not function. 1-715 controls are painted on.
Perform GAS adjust	9				1-to GCS.
Check power control handles	Ş	¥2	2	ž.	3-Last battoms operate without squeezing pain grips. 3-Gen tube does not automatically elevate over rear dect.
Check manual elevation/traverse cramks	2				1-No merceal creats.

	(4) Positive Trans/Cor? Coments	1-No apparent reticle movement as a function of turret traversal.	1-Ho firing circuit tester.	1-No crosswind sensor.	1-Ho hydraulic pressure gage.
21	-				
17 Respon	ez j				
te Coment	Element?				
Provi	(1) Perform/ Prectice?	2	9	2	9
	Activity 1. PREMAE STATIONS FOR OPERATION	(cont'd) Perform lead system check	Perform firing circuits check	Perform crosswind sensor check	Perform hydraulic pressure check

vide Coment	Every 5-R Positive Element? Same? Trans/Cor?	1-Hain gun is assumed to be boresighted.	1-No ceax.	YES NO YES 3-Stimuli would differ since previous procedures cannot be performed.	YES YES YES	1-60º door is painted closed.	TES TES TES	10 WS 745 2-46 TIS.		TES TES TES
2	Every			TES	Æ		E	9		ŞĮ.
ξ	≥ €	ç	2	YES	YES	2	Ē	Ş	8	TES
	Activity 2. PORTORN PREPARE- TO-FINE CHECKS	Boresight asin gun	Zero coax	Report weapon status	Index battlecarry ammo on AMMO SEL switch	Introduce battlesight range into CCP	Option 2.1. Presere for offense Receive TC briefing YES YES YES	Option 2.2. Prepare for defense Inspect terrain through GPS/TIS	Check GAS clearance	Learn TRP locations/ranges

ity 3. 2.1 1.3.1.1	(1) (2) Perform/ Ever Practice? Elea	(2) Every Element? Conditions.	Same?	15 NO (4) Positive Trans/Cor?	Comments
Option 3.1.2. Closed hatch - day Select 3X GPS/TIS magnification YES Search on gun axis using GPS YES Alternate using GPS with TIS NO Execute search techniques to acquire targets	하는 한 한	题 图 题	755 TS	5 5 5 5	3-Shapes of objects change as a function of magnification.
Option 3.1.3. Hight SIMET does not simulate night viewing conditions.	enting condit				
Part 3.2. Detaction/Location/Identify Target(s) Detect targets(s)/signature(s)/ obstacles Locate target(s)	tify Tanget((a)	8 2 <u>7</u>	五克	2-No target signatures other than dust and smoke from moving vehicles. 3-Nost obstacles have little effect on tank movement. 4-Expected transfer is mil.
Identify target(s) making the following determinations: IfFN Nomenclature If target detected, announce GUNNER REPORT, TARGET>, <location></location>	ž ž ž	25 E	WES NO.	00 SS	3/4-Easier than actual task due to color distinction (friend - brown/threat - green); expected transfer is mil. 3/4-Easier than actual task due to the limited array of threat targets (172, BPP); expected transfer is mil.

Response 1s WO	(3) (4) S-R Positive	ene? Trans/Cor? Coments	KES YES	3/4-Range cues from CRT displays are substantially different from real world cues: NO NO puts experienced personnel at disadvantage.	
ment 17	(2) rery	s 2	ا ا	S)	
Provide C.	(1) (2) (3) Perform/ Every S-R P	Practice? El	TES TES TES	YES YES NO	
		Activity 3. ACQUINE TANGET(S) (cont'd)	Confirm acquisition report	Estimate renge to evaluate LRF return	Part 3.3. Evaluate situation

G-4-5

No gunner actions specified

Coments									3-Shapes change as a function of magnification.		Ju-nu similation of tempers. System; less to acquiring imappropriate tracking behaviors, e.g., "ambushing" targets.		3/4-LRF will fire without squeezing palm switches; may be source of negative transfer.								
15 80 (4) Positive Trans/Cor?	£5	YES	YES	YES	TES	TES	755 	TES	TES 325	TES	9	TES	m 3/4	TES	ž.	YES	YES	MES	TES	155	TES
Provide Councent 1f Response Is NO	ÆS	TES	MES	Æ.	TES	TES	TES .	TES	9	YES	9	¥ES	2	TES	TES	YES	YES	¥ES	YES	¥55	YES
Provide Coment 1 (1) (2) Perform/ Every Practice? Element?	Ž.	TES	YES	Æ	TES	YES	TES	TES	ĬŽ.	YES	žĮ.	TES.	Æ	Ę	ÆS	MES.	TES	YES	Ę	MES	MES.
Provide (1) Perform/ Practice? - moving (of	YES	MES	TES	MES	TES	¥ES	TES	TES	TES .	YES	YES	WES	TES	TES	TES	YES	YES	MES	TES	MES	TES .
Activity 4. ENGAGE SINGLE TANGETS Perform/ Every WITH THE PAIN GIN Practice? Elemen Option 4.1. Practision engagement - moving (offense)	Set/check switches: FIRE CONTROL HODE: HORMAL	. LIFE: ARM LAST RTH	× .50	. GIM SELECT: MAIN	. APTO SELECT as announced	Sight through GPS	Grasp palm switches	Announce IDENTIFIED	Switch GPS to last	Lay on center mass of target	Track moving target	Listen for driver alerts	Depress lase button(s)	Evaluate range display	Check ready-to-fire and fault symbols	Make control lay	Listen for UP	Listen for FIRE	Announce ON THE MAY	Squeeze trigger(s)	Continue tracking

	Comments								
te Is 80	(4) Positive Trans/Cor?	MES.	YES	Ē	1		ÆS		ā
17 Respons	(2) A (3)	YES	TES	¥ES			TES		ā
Provide Comment 1f Response	(2) Every Element?	YES YES YES	TES	TES	d target		स्ड स्ड स्ड	១	YES YES YES
Provi	(1) Perform/ Prectice?	TES	TES	TES	fy amounce		YES	rect target	ŞĮ.
	Activity 4. ENGAGE SINGLE TANGET WITH THE MAIN GAN (cont'd)	Announce ON THE MAY	Squeeze tripger(s)	Continue tracking	Option 4.3. Gunner cannot identify announced target	Case 4.3.A.:	Amounce CANNOT IDENTIFY or does not respond	Case 4.3.8. GMR identifies incorrect target(s)	Amounce IDENTIFY <01FFERENT TARGET>
									G-

SIMMET does not simulate thermal optics viewing conditions

Option 4.4. Use TIS

Comments	2/3-Recoil is not simulated.				3/4-No simulation of lead sensor system; has no effect.	INDER OF ENGAGNENT SAME AS PRECISION (Option 4.1 or 4.2)			(See comments above)			RENAINDER OF ENGAGDRENT SAME AS PRECISION (Option 4.1 or 4.2)		(See comments above)		INDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2)
(4) Positive Trans/Cor?	¥	Đ.		YES	2	JER OF ENGAGE		ÆS	9	YES	TES	ER OF ENGAG		2	TES	JER OF ENGAGE
	2	YES		TES	2	REMAIN		YES	2	TES	TES	- REPAIR		8	TES	REPAIR
(2) Every	2	TES	:	TES.	TES	•		TES	TES.	TES	TES	(MG)		TES	£	8 8
Provid (1) Perform/ Prectice?	Ž	TES	:	YES	Æ			YES	TES	TES	TES			Æ	TES	
Activity 5. ADJIST FIRE	Recover sight picture	Observe/announce strike of every round	Option 5.1. Reengage	Announce REENGAGING	Release/reengage palm switches		Option 5.2. Standard adjustment	Observe/announce deflection and range error	Release/reengage palm switches	Adjust 1 mil deflection	Adjust 200 meters range		Option 5.3. TC adjustment	Release/reengage palm switches	Apply IC correction	

Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX

SIMMET does not simulate coax engagements.

Provide Comment if Response Is NO (1) (2) (3) (4) Perform/ Every S-R Positive Practice? Element? Same? Trans/Cor?		MES	
17 Respons		TES TES TES TES	
(2) Every Element?		MES	
Provid (1) Perfora/ Practice?	_	žž	8
ACTIVITY 7. ENGAGE MALTIFULE TANGETS WITH THE MAIN GAN	Engage first target using precision gunnery (Option 4.1 or 4.2)	If first target is not destroyed, adjust fire as described in Activity 5	Engage second target using precision gumnery (Option 4.1 or 4.2)

Activity B. ENGAGE TANGETS
WITH THE CAL. 50
(INCLUDING SIMALTANEOUS WAIN GUN
ENGARENTS

SIMMET does not simulate cal .50 engagements.

Coments		3-MPD SELECT has no effect on BS range; for either Sabot or HEAT; the displayed range is 1200 meters.					
se is NO (4) Positive Trans/Cor?	55 25 55	5 5 5	Ę.	Ş	ž	ž ž ž	ST.
Provide Comment if Response Is NO 1) (2) (3) (4) Ornal Every S-R Positi tite? Element? Sems? Trans, sight gunnery	75 TF 27	£ 5	題) 	237	范 克 克	£
(2) Every Every Element?	ž ž ž	ž ž	TE TES	turns from	ÆS	克 克 克	T. S.
(1) Perfora/ Prectice?	AS ST ST	5	YES	ineffective LIG.	YES	ž ž ž	YES
Activity 9. ENGAGE TANGETS USING (1) DECRAND GUMERY TECHNIQUES Option 9.1. Engage targets using battlesight gumnery Set/check switches:	FIRE CONTROL HODE: NORMAL. 'LINE: SAFE 'GPS: 3X	GUN SELECT: MAIN ' AMMO SELECT: battlecarry ammo	Engage target using practision gamery (Option 4.1 or 4.2) but without lasing to target YES YES Option 9.2. Engage target given ineffective LNE	SIMMET does not simulate ineffective LMF. Option 9.3. Engage target given multiple returns from LMF Depress lase button(s) YES	If miltiple return symbol appairs in GPS, announce RANGE <in weters=""></in>	Switch LPE setting in accordance with TC instructions Relay on target Depress lase button(s)	Squeeze trigger(s)

Coments													
Activity 9. ENGAGE TARGETS USING (1) (2) (3) (4) DECRADED GUNNERY Parformy Every 5-R Positive TECHNIQUES Practice? Element? Same? Trans/Cor? (cont'd)	Option 9.4. Engage target given no range display (loss of symbology) SIPMET does not simulate loss of symbology.	Option 9.5. Engage target given crosswind sensor failure	SIMMET does not simulate crosswind sensor failure.	Option 9.6. Engage target given cant sensor fallure	SIMMET does not simulate cant sensor failure.	Option 9.7. Lead angle sensor fallere	SIMMET does not simulate lead angle sensor failure.	Option 9.8. Engage target given GPS failure (day channel)	simulate thermal	Option 9.9. Engage target given GPS/TIS failure	Case 9.9.A. Use GAS	Original plans for SIMET called for GAS reticle to automatically appear in GPS sight as a result of GPS failure. Software problems prevent this option from being used at present.	Range cannot be indexed in ballistic computer.

sponse Is NO	(4) Positive Trens/Cor?
f Re	S X S
Provide Coment 1	(2) Every Element?
	(1) Perfora/ Practice?
	Activity 9. ENGAGE TANGETS USING DECANDED GUNERY TEDMIQUES (Cont'd)

Case 9.9.8. Use battlesight guomery

Engage target using battlesight gunnery (Option 9.1)

Option 9.10. Engage target using GAS

SIMET does not provide GAS.

Option 9.11. Engage target given stabilization system failure (emergency mode)

Original plans for SIMET called for similation of stabilization system failure and for the fire control system to operate in emergency mode. Software problems prevent this option being used at present.

Option 9.12. Engage target given turret power failure

SIMET does not similate turnet power failure; manual controls are not provided.

Comments	1-TIS controls are painted on; THEBUM, NCOE suritch is painted in OFF position.		Coments 1-No MS; pun tube is assumed to be straight at all times.	
(4) Positive Trens/Cor?	ē 5	5	te 1s 100 (4) Positive Trans/Cor?	'
Provide Comment 1f Response Is NO 1) (2) (3) (4) form/ Every S-R Posttl tice? Element? Same? Trans.	ð 5	5 5	Provide Comment of Response Is NO 1) (2) (3) (4) (4) (6) (4) (7) (4) (7)	
(2) Every	ž ž	5 5 E	(2) Every Element?	
(1) Perform/ Practice?	5 8 5 E	5 5 5	Provide (1) Perform Practice? NO NES	
Activity 10. EMBAGE TANCET FROM TC POSITION (TC performs these behaviors in 3-man empagements)	Set/Chect switches: FIRE CONTROL HODE: MODEWAL TIS: STBY/ON TIS: ANN LAST RTR	. GPS: 10K . GAM SELECT: NAIN . AMED SELECT: as announced	Activity 11. ASSESS RESULTS Performy El Check/adjust MRS NO Index battlecarry amo YES Y	

APPENDIX 6-5
EVALUATION OF U-COFT ON TANK COMMISER ACTIVITIES

	Coments	1-Enter U-COFT through cartains at rear.	2-Cannot practice task w/AUX NYOR POWER; "engine" always runs.	Pannot turn on smallflam so landamic continu	3-IMT switch does not function.		1-"Match" is sealed; does not operate.	2-Cannot open hatch to adjust platform.	1-No TC weapon.	3-Purpose of knee guard is to protect these from main gun's recoil, which is not shunlated.	3-Broupads have extra play due to "recoll."		3-No motion cues,	3-Only one unity window at CHS.	
(5)	Positive Trans/Cor?		TES	S	TES	TES .		TES		TES.	TES	Ş	S	YES	
Provide Comment 1f Response 1s NO	Every Element?		NO YES	TES TES	9	TES TES		NO YES		YES NO	22. S2.	TES	TES 180	YES NO	
3	Practice?	8	Æ	TES	TES	52	9	YES	2	TES	TES	Ę	ES .	YES	
	Activity 1. PREPARE STATIONS FOR OPERATION	Enter station	Power up CAS/turret	Operate domelight	Operate intercom	Adjust seat	Adjust hetch	Adjust platforms	Install TC's weapon	Adjust kneeguard	Adjust GPSE headrest, lens	Check manual range controls	Check power control handle	Check CAS in power/manual modes	

	Frovide Coment if Response is NO (2) (3) (4) Yeary S-R Pesitti tice? Element? Same? Trans/Co S NO NO NO NO YES YES YES YES YES YES NO NO NO NO	1 1 1 1 1 1 1 1 1 1	
Brief crew YES	01	£\$	1-maps mave not present for U-CAF1 terrain. 2/3-Loader/driver are not present.
Control driver, if necessary to maintain position in plt formation, and to exploit cover and concealment			1-TC can only start/stop "driver"; no real control over movement. 1-U-COFT limited to single tank gunnery.

	Provid	ent 10	Response	1s 110	
Activity 2. PEHOUN PREPANE- TO-FINE CHECKS (CONT'4)	Perfora/ Prectice?	Every Element? S	i	Positive Trans/Cor?	Coments
Option 2.2. Prepare for Defense					
Move with platoon to occupy battle position	2		1		1-U-COFT limited to single tank gunnery. 1-Cannot select battle position.
Receive defensive mission/ position commo	TES	TES TES	2	ÆS	
Propere primary/alternate/ supplementary positions	9		1		1-Cannot move between defensive positions.
					2-Trafficability cannot be determined. 2-Terrain features (especially defiles) are difficult to identify. 2-Cover and concealment only applies to defilede (stationary engagements). 3-View is limited to buttoned up mode and only through GPSE, CMS sight, and FUP. 3-Ranges are difficult to estimate (see comments at "estimate range").
Analyze terrain	ÆS	02		2	3-Obstacles are irrelevant since TC cannot control driver. 4-Because of preceding problems, transfer would be mil. 2-Sectors of fire are irrelevant because U-COFT is limited to single tank gunnery.
Prepare tank shetch card	¥5	£	₽	9	3-No open-matten of associated recon of defrain. 3-Only limited target reference points can be noted, e.g., no friendly artillery cites are represented. 4-because of problems transfer would be practically nil.

Activity 3. ACQUINE (1) TAMGET(S) Perform(Part 3.1 Search for Target(s) Option 3.1.1. Search open hatch - day U-COFT does not simulate open-hatch viewing	(1) Perforal Practice? Practice? - day Itch viewing	Provide Comment if Response 1s ND) (2) (3) (4) orn/ Every S-R Posit tilce? Element? Same? Trans/	nse 1s 110 (4) Positive Trans/Cor?	
360°	ار ار	YES NO	₽ ₽	4-Must use FUP and traverse; experienced cremmen w 4-Targets appear only in forward sector of view. 4-Must use FUP and traverse; experienced cremmen w 14-Targets appear only in forward sector of view. 14-Only one sort of aircraft is represented: WINC-
ce search techniques	7	2	YES	3-Limited by having only one UP. 3-Carteonish display provides unrealistic search context.
Option 3.1.3. Search at night Search 360° Use off center vision	SŽ DB	YES BO	8	use all UPs and not traverse.
fect./L	farget(s)		₽	2-Limited array of targets. 2/4-TC cannot control movement around obstacles; could provide megative transfer. 3-Cartoonish images limit realism.
Locate target(s)	TES	YES NO	TES	3-carteonish images limit realism.
Identify target(s) by:	£5 £5		2 <u>7</u>	2-(imited array of targets; makes U-COFT task easier than combat task. 3-(imited detail on targets; makes U-COFT task more difficult than combat task. 2-(imited array of targets; makes U-COFT task easier than combat task. 3-(imited detail on targets; makes U-COFT task more difficult than combat task.
Note number of target Classify multiple targets as most dangerous/dangerous/ least dangerous	75 TS	TES TES	£5 25	

Coments	2-Can receive report only from GMR 3-Although target sizes are appropriate for range, objects are difficult to distinguish (e.g., trees - hills)	making relative size judgments difficult. 3-Lay of land is difficult to determine. 3-Depth cues relating to clarity & color saturation are absent. 4-Experienced soldier reported difficulty in judging U-CDFT distances.			1-Crew always engages targets. 1-Other tanks in platoon are not represented.			2-No LDR's MG. 4-System will score error for selecting SABOT for HIMD-D, which is doctrinelly incorrect.			2-Ho Ldr's MG.	
(4) Positive Trans/Cor?	YES	2	3					£			YES	
1f Respon (3) S-R Seme?	TES.	2	ES					Š			SS.	
(2) Every	2	£	Æ					£			오	
Provide (1) Perform	Ş	2	TES		æ			25			ZZ.	
Activity 3. ACQUINE TANCET(S)	Confirm acquisition report	Estimate range to select weapon(s) and to evaluate LIV return	Send contact report to plateon leader	Part 3.3. Evaluate Situation	Decide whether or not to engage contingent on:	· Platoom fire plan	. Plt ldr comend	Select the appropriate veapon/ammunition and the firing mode (precision/degraded) contingent on:	 Type of target (hard/soft, point/area) 	Tank status aumo, malfunctions	Determine crewman (GMR, IC, LDR) and the type of fire command (single, multiple, or simul- taneous) contingent on: . Number of targets	Target classification

Comments			2-TC can stop tank only in degraded ("stab out") exercises. 2-Tank cannot move into defilade.		1-Cannot execute action drill.	4-System will score error for firing SABOT at MIND-D.					3-Computer synthesized voice.			4-System will score error for firing SABOT at MIND-D.			
(4) Positive Trans/Cor?	Ton gennery	ÆS	TES .	ž.		2	ŽŽ.	YES	YES	45	TES	YES 1on gumery	TS T	2	YES	Ş <u>P</u>	¥ES
Provide Comment 1f Respon) (2) (3) orm/ Every 5-R iller Element? Same?	fense using precis	YES YES	NO YES	TES TES		YES YES	YES YES	YES YES	YES YES	YES YES	YES NO	YES YES LEGENSE USING precis	TES TES	YES YES	YES YES	YES YES	YES YES
Provis (1) Perfora/ Practice?	from the o	YES	YES	YES	2	Š	¥ES	ÆS	ÆS	Ş	TES	YES from the d	YES	YES	YES	MES.	YES
Activity 4. ENGAGE SINGLE TANGETS WITH THE MAIN GAN	Option 4.1. Engage single target from the offense using pracision geneery	Issue contact report: CONTACT <directions <targets<="" th=""><th>Decide whether to engage target while moving or from a short halt</th><th>If engaging from a short halt, issue driver command: DRIVER SIGP</th><th>Relay any action drill command</th><th>Issue fire command GUNNER AMPCD-<1ANGET></th><th>Lay gun (simultaneous with fire comend)</th><th>Release override</th><th>Sight through GPSE</th><th>Evaluate range display</th><th>Listen for UP</th><th>ANDOUNCE FIRE, FIRE -ALTERNATE AND -OPTION 4.2. Engage single target from the defense using precise</th><th><pre>Issue contact report CONTACT <0IRECTION>, <ianget></ianget></pre></th><th>Issue fire command GUNNER < APRD> <target></target></th><th>Announce DRIVER HOVE OUT, GUINER TAKE OVER</th><th>Lay gun (simultaneous with fire command)</th><th>Release override</th></directions>	Decide whether to engage target while moving or from a short halt	If engaging from a short halt, issue driver command: DRIVER SIGP	Relay any action drill command	Issue fire command GUNNER AMPCD-<1ANGET>	Lay gun (simultaneous with fire comend)	Release override	Sight through GPSE	Evaluate range display	Listen for UP	ANDOUNCE FIRE, FIRE -ALTERNATE AND -OPTION 4.2. Engage single target from the defense using precise	<pre>Issue contact report CONTACT <0IRECTION>, <ianget></ianget></pre>	Issue fire command GUNNER < APRD> <target></target>	Announce DRIVER HOVE OUT, GUINER TAKE OVER	Lay gun (simultaneous with fire command)	Release override

Coments								3-TRPs are cartoonish and difficult to distinguish.								
se Is NO (4) Positive Trans/Cor?	TES	TES	TES	Ð			ā	TES	HES			ÆS				
17 Respon	žį.	YES	YES	52			£\$	2	2			ÆS				
(2) Every	YES	WES	¥ES	Ş	d target	3	52	YES	\$		ret(s)	Ž				
(1) Perform/ Practice?	Ę	Ę	Ę	YES	y announce	Ify target	YES	MES	TES		orrect tar	2				
Activity 4. ENCAGE SINGLE TANGETS WITH THE MAIN GIN (cont'd)	Sight through GPSE	Evaluate range display	Listen for UP	Announce FIME, or FIME, FIME	Option 4.3. Gunner cannot identify announced target	Case 4.3.A. Gunner fails to identify target(s)	Direct gunner onto target using . Command TMAVENSE «LEFT or RIGHT», STEADY, ON	. Use TRP	Announce WATCH MY TRACERS and use .50 caliber tracers to point to target	Announce FROM MY POSITION and proceed with TC engagement (see Activity 10)	Case 4.3.B. Gunner Identifies incorrect target(s)	If GMR is correct, issue a correction to the fire command YES	If GMR has identified the wrong target, treat as Case 4.3.A and proceed	Option 4.4. Use 715	Engage targets using precision gunnery (see Option 4.1 or 4.2)	

Coments	2/3-Simulated recoil is too weak to cause loss of sight picture. 3-Other effects of firing (odor, smoke) are not simulated. 3-Round bursts are uniform, cartoonish flashes.	3-Probability of "LOST" is practically mil. 3-Fime limitations preclude observations. 3-Target observation is easy because target changes color (green to black).	1-Cannot hit target without "destroying" it.		3-Poor range cues (see previous comments on "Estimate Range" element).										
(4) Positive Trans/Cor?	25	YES		•	YES	YES	•		•		YES	•	¥.	YES	
Provide Comment if Response is NO (2) (3) (4) (4) (4) (5) (4) (5) (5) (6)	YES NO	YES NO			YES NO	TES TES			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		WS WS		NES NES	NES NES	
Provid (1) Perform/ Practice?	TES	MES.	2	aut	Æ	ÆS					5	•	YES	YES	
Activity 5. ADJIST FIRE	Recover sight picture	Observe strike of round	If TARGET was observed, determine whether or not target was destroyed	Option 1.5. Use reempage technique	Evaluate range	Amounce FIRE		Option 5.2. Standard adjustment No TC actions specified		Option 3. TC Adjustment	Issue subsequent fire command to adjust fire .5-3 mils in deflection and .5 - 2 mils (100-400 meters) in range		If target is destroyed or exposure too long, command CEASE FIRE	If in defensive posture, command DRIVER, BACK UP	

Coments				3-Poor range cues (see comments at "Estimate hange").			
	ž.	VES	TES	MES	TES	TES	N.C.
Same?	TES.	TES TES	TES TES	YES NO	TES YES	TES TES	YES YES
(2) Every	YES YES YES	ÆS.	Æ	YES	Æ	YES	ĘŞ
Provide Comment if Respon (1) (2) (3) Perform/ Every S-R Practice? Element? Same?	YES	YES	YES	TES	YES	TES	TES
Activity 6. ENCAGE A SINGLE TANGET WITH THE COAK	Issue fire command GIMMER COAK <target></target>	Lay gun (simultaneous with fire command)	Release override	Evaluate range display	Amounce FIRE	Monitor/evaluate engagement	Command CEASE FIRE

		Chammail	6.1				2/3-Severe U-COFT time standards are difficult to meet; student may not get this far.			
ie Is 110	(2)	Positive True	I I GHB/CH I	ÆS			TES		WES	
ent 1f Respons	(3)	form/ Every S-R Positive	Frecince: Clement: Some	TES TES TES			YES NO NO		TES TES TES	
1de Com	(2)	L K		뛜			2		¥	
Prov	Ξ	Perform/	ייים ביונים	YES			ħ		MES	
	Activity 7. ENGNE MALTIPLE	TARETS WITH		Issue fire commend: GUNNER - ALGAT/LETS - TANGETS FIRST	Engage first target using precision gunnery (Option 4.1 or 4.2)	If first target is mot destroyed, adjust fire (Activity 5)	If first target is destroyed, announce <#EXT> TARGET	[Continue until all targets are destroyed]	Announce CEASE FIRE	

Coments			1-No Cal .50 charging handle.	3-Although target sizes are appropriate for range, objects are difficult to distinguish (e.g., trees - hills)	making relative size judgments difficult. 3-Ley of land is difficult to determine. 5-Depth cmes relating to clarity & color saturation are absent. 4-Experienced soldier reported difficulty in judging U-COFT distances.					
(4) Posttive Trans/Cor?	TES .	ĘĘ.		Æ	2	TES	MES	YES	ğ	
Provide Comment if Response Is NO 1) (2) (3) (4) form/ Every S-R Positi ctice? Element? Same? Trans/	ZŽ.	TES		MS	2	TES.	TES	YES	YES	
(2) Every Element?	5	, sp		TES	ÆS	žĮ.	YES	YES	Æ	
Provide (1) Perform/	TES	TĒS	9	ÆS	YES	颓	TES	TES	TES	
Activity 8. ENGAGE TAMGETS WITH THE CAL .50 (INCLUDING STAR TAMEDUS MAIN GUI ENGAGEENTS	Option 8.1. Simultaneous targets Issue fire command: GUNNER <mprd> <tanget>, FIRE AND ADJUST</tanget></mprd>	Option 8.2. Cal .50 targets Amounce: CALIBER FIFTY	Charge TC's weapon	Lay weapon for deflection	Estimate range to target	Lay Od5 sight range line on target	Fire bursts of 10-15 rounds	Adjust fire if needed	If target is destroyed, announce TC COMPLETE	

Comments			3.Although target sizes are appropriate for range, objects are difficult to distinguish (e.g., trees - bills)	making relative size judgments difficult. 3-Lay of land is difficult to determine. 4-Experienced soldier reported difficulty in judging U-CDFT distances.										3/4-Range cues in U-COFT are substantially different from real world; puts experienced IC at disadvantage.	
(4) Positive Trans/Cor?		YES	YES	Q.	5 5	YES		6 6 1					YES	Q.	YES
Provide Comment if Response is NO (2) (3) (4) (4) (7) (4) (7) (4) (7)		žį.	1 23	2	TES	Ę		•					1	2	ÆS
(2) Every	gunnery	YES	YES	YES	YES	ÆS			fective du hoice of				ž	YES	Ę.
Provid (1) Perform/ Practice?	batt les ight	MES	YES	TES	s MS	YES		ineffective	endered inefi TC has the ci chniques:	Nery	gunnery		ÆS	YES	YES
Activity 9. ENGAGE TANGETS USING DEGRADED GUNERY TECHNIQUES	Option 9.1. Engage targets using battlesight gunnery	Issue fire command: GUNNER BATTLESIGHT <tanget></tanget>	Depress MANUAL RANGE BATTLE SGT button	Estimate range to target	If target outside of +-200 meters of battlesight range, enter range change using MAM RNG B/S ADD BNOP toggle switch	Check range readout in GPSE	Engage target using precision gumery (Option 4.1 or 4.2) but without evaluating LRF display	Option 9.2. Engage target given ineffective LRF	If LRF fails to function or is rendered ineffective due to environmental conditions, TC has the choice of using one of the following techniques:	Case 9.2.A. Use battlesight gunnery	Engage target using battlesight gunnery (Option 9.1)	Case 9.2.8. TC indexes range	Issue fire command: GUNNER <amad> TARGET</amad>	Estimate range to target	Index range using MAM RMG B/S ADD/DROP toggle switch

Coments	3/4-Range cues in U-COFT are substantially different from real world; puts experienced TC at disadvantage.				3-Although target sizes are appropriate for range, objects are difficult to distinguish (e.g., trees - hills) making relative size jadgments difficult. 3-Lay of land is difficult to determine. 3-Depth cues relating to clerity & color saturation are absent. 4-Experienced soldier reported difficulty in judging U-CDFI distances.								
6 15 NO (4) Positive Trans/Cor?	9	YES			2	3	Æ		MES		YES	YTS	
Provide Comment if Response Is NO (2) (3) (4) orm/ Every S-R Postt titce? Element? Same? Trans/	YES	YES YES		irns from LRF	YES NO	YES YES	YES YES		TES TES		TES TES	YES YES	
Provid (1) Perfora/ Practice?	ÆS	YES	range	multiple ret	YES	YES	£		TES		YES	Ş <u>.</u>	
Activity 9. ENCAGE TABETS USING DEGRACED GRAWGYY TECHNIQUES (cont'd) Case 9.2.C. GNR indexes range	Estimate range to target	Issue fire command: GUNNER <apod index="" range<="" th=""><th>Case 9.2.D. GMR manually applies range Engage target using GAS (Option 9.10)</th><th>Option 9.3. Engage targets given multiple returns from LRF</th><th>Estimate range</th><th>Evaluate range display</th><th>If range appears incorrect, may instruct GMR to switch LRF setting from ARM LAST RTM to ARM IST RTM or vice versa</th><th>Case 9.3.A. Gunner relases</th><th>Amounce relase</th><th>Case 9.3.8. TC corrects range</th><th>Correct range using MAM RMG B/S ADD/DROP toggle switch</th><th>If displayed range is within +-200 m of estimated range, announce FIRE</th><th></th></apod>	Case 9.2.D. GMR manually applies range Engage target using GAS (Option 9.10)	Option 9.3. Engage targets given multiple returns from LRF	Estimate range	Evaluate range display	If range appears incorrect, may instruct GMR to switch LRF setting from ARM LAST RTM to ARM IST RTM or vice versa	Case 9.3.A. Gunner relases	Amounce relase	Case 9.3.8. TC corrects range	Correct range using MAM RMG B/S ADD/DROP toggle switch	If displayed range is within +-200 m of estimated range, announce FIRE	

Coments						£			I-Inducting ors Tallure Will also Induce 113 Tallure; CONSequently 16/ban Should proceed to Uption 9.
Activity 9. ENCAGE TANGETS (1) (2) (3) (4) USING DEGLACED Perform/ Every 5-R Positive GUNNERY TECHNIQUES Practice? Element? Same? Trans/Cor?	Option 9.4. Engage target given no range display (lass of symbology)	U-COFT does not simulate loss of symbology	Option 9.5. Engage target given crosswind sensor failure	U-COFT does not simulate crosswind sensor failure	Option 9.6. Engage target given cant sensor failure	U-COFT does not simplate cant sensor failure	Option 9.7. Engage target given lead angle sensor failure U-COFT does not simulate lead angle sensor failure independent of stab failure	Option 9.8. Engage target given GPS (ailure (day channel)) If no GPS image, have GMR switch to thermal channel and engage tarnets using TIX (fortion 4.4) and	

If both GPS and TIS fail, the TC has the choice of using one of the following engagement techniques

Case 9.9.A. Use GAS with precision techniques

Engage targets using GAS gunnery (Option 9.9)

	1-derse to larged to a "alvest" to 8-COFT 646 exercited.		1			Marker resp (not previous compets).
Parities Trest/Get	P	ननन	12	999		e = =
hypita (aments 14 beneaus (1) (2) (3) hypital (beneaus Sent Tr fit technisms mary (Option 9.1)	165 parage 23		TO TO TO TO THE TAXABL	# # # # # #		2 E E
(1) Perfora President	3 0 2	विवि	1 1 E	===	4 4	ननन
Activity 9. EMDME TRANSTS (1) (2) GRING BERNARD Porford Every Cont. 4) Cont. 6) Cont. 7) Cont. 6) Cont. 6) Cont. 6) Cont. 6) Cont. 6) Cont. 6) Cont. 7) Cont	Continue 9.16. (space terrent salva 6th parmers firstunte renge to terrent lisme fire comment: commits corner closests	Lay gas (simultaness with fire TS TS TS TS TS TS TS TS TS TS TS TS TS	State for comments State for comments County and (startement offs fire The fire for the teament offs fire The fire for the teament offs fire	Select Street Street	Section 5,12, Change Server glosse Server for Miles (to ment)	Danie fire commit- comfis -400 -400fi- -410ffile- 400fi- bernance file Ammires 97415, 400 Off

Comments							3-Although torpet time are appropriate for range, abjects are difficult to distinguish (e.g., trees - hills) and the relationship projects are presented to the contract of th	Debyth cost relating to clority & color saturation are absent.	d-Emericaced soldier reserved difficulty to Judytes P-COTI distances.									
Transfer of the state of the st			425			12			8	F	2	E E	12	T.	P	H	E .	
(1) (2) (3) (3) (4) Protect of the control of the c			TO TO TO			TIS TIS TIS			TS TS 10	TIS TIS TIS	713 - 713	TI TI TI	TO TO TO	713 - 713	TS TS TS	715 TIS 115	TIS TIS	
		THE PARTY	E.		a	12			F	E	T	H	E	T.	F	¥	Ti	
Activity 16. (NOME TRACTS FROM NA. N. POSTTION (Also Terro No. Con. (Apparents)	Same one of the following fire comments:	Core 18.A. Gamer connect Monthly Spring	FEET AT POSSIBLE	•	Care 10.8. Term-me crae (m 08)	-			College range to target	Style through O'K	Lay on contar mais of target	Depress tem betten	feelade ramp eleploy	Make control toy	Assessed IN TAX MAY	Square trippe	MILE BYEN COMMENTS	

Comments)-Sattle demagn/commolities are not represented.	1-6-COFT has only TC and GOD crew position,	Defectise may stop before SPOTHEP can be given,		3-Commet move between firing positions.		1-Comes change rentes.	2-TWE can ealy respend to stop/unive out.			
Pasitive Trees/Cer?			22					F	Ş	ā	Ş
(2) (3) (wry 5.4 (beaut) 5.4			TS 80					10 MS	72 72 73 TE	T5 T5 T5	<u> </u>
E SE SE	9	8	T.		9		8	F	Ş	ş	¥
ACTIVITY 11. ASSESS SERATS	Assess bottle damps/ compilies	Brismins If and has cree shawld be rearganized to fight to a three-was configuration	Issue Storage	Case 11.A. Stationery	primary, elicrate, or may to primary, elicrate, or supplementary firing positions	Case 11.8. Maring	Deterrates changes to reate	lates driver commends	Determine appropriate sees for anticipated tarpets	AND OF ELECTOR	fator battlecarry roops ssing the resent bailt set analyses toggle switch

EVALUATION OF STREET ON TAKE CORRUPER ACTIVITIES

Commets	1-Enter SIMET through door at side of crew compartment. 2-No DS FORE/MANIM. lever. 2-PAEL LIGHTS adjust hasb is painted on. 2-PAEL LIGHTS adjust hasb is painted on. 2-PAELLIGHTS FORER POER switch is a simple taggle, not the pell-out/set switch on actual tamb. 3-ENGIE FIRE and DTS EAR OFFE warning lights are painted on. 3-ENGIE FIRE and DTS EAR OFFE warning lights are painted to switch is existed in the OFFE switch.	Additional of the state of the	- Dempite the not go completely off.	3-Footrest bar is not represented. 2-Footrest bar is not represented. 3-TC sect does not flip down. 3-TC sect does not flip down.	3-Expected transfer is sil,	1-40 hatch.]-the platform.	1-to CX, .50.	1-do basement.	-D'E bere dres met ed bet.	Prograftess of APPRILTION SELECT switch position, BS ronge is 1200 meters.	JA-JE will fire without squeezing palm grips.	Flurret traverses only 300°.
Positive Trem/Ger?		2	E E	2	8	1					173	2	1
ea j		2	8	8	9						8	8	8
C Least		9	¥	8	9						2	2	2
(1) (2) (3) (3) (4) Provident (4) (3) (4) Fraction (5) Fr	2	T.	Ş	123	T.S	8	8	8	8	2	ā	2	TE
Activity 1. PRIME STATIONS FOR OCTATION	Enter station	Peatr up OS/turret	Operate descripto	Operate laterces	Adjust seet	Myst letch	Adjust platform	Install TC's unspen	Adjent breequend	Adjest D'St headrest/lens	Check mensel range controls	Check power control handle	Check CAS in pewer/menual modes

Activity 2. PENGUN MEANE- TO-THE CHECKS	(1) Perform	Provide Comment of Respon) (2) (3) orm/ Every S-R cites? Element? Same?	17 Response (3) S-R Smm ?	(4) Posttive Trens/Cor?	Comments
Seperalse/easist boresight	2				1-SIMET gun is chays boresignted.
Boresight TC's weapon	9				1-te CM. :59.
Zero TC's weapon	2				1-18-04. 39.
Select/amounce battlecarry APID, RANGE	ā	ā	2	2	3-TC can select and announce battlesight range, but GMR cannot input late CCP. 4-Irains TC to ignore this step.
Option 2.1. Presers for offense					
Receive offensive mission/ formation/movement/comp	ħ	153	TES	MES	
Analyze terrain	MES	ÆS	2	TES	3-regarding is spares, e.g., then limit are only one thee deep. 3-Obstacles have less effect on SIMMET than they do in real life.
Cleck map overlay	Ţ.	ÆS	2	TES	3-SIMMET terrain is smoothed; requires special maps.
Drief crav	MES	YES	MES	TES.	
Control driver, if necessary to maintain position in plt formation and to exploit cover and concesiment	ā	띭	2	ā	
ition 2.3. Prepare for defense	1	 - -	l I		
Move with platoon to accupy battle position	TES	ZŽ.	2	72	3-Tanks in platoon are identical making them difficult to distinguish.
Receive defensive mission/ position commo	TES	MES.	Ž	Æ	
Prepare primary/alternate/ supplementary positions	2				1-Cannot dismount to prepare positions.
Analyze terrain	YES	¥£S	9	TES	J-regeration is spaint, e.g., the limes are only one tree deep. 3-Obstacles have less effect on SIMMET than they do in real life.
Prepare tank sketch card	YES	ÆS	2	2	Systems attents instance (which is not in actual tame) and LRF, it is easy to prepare a formal range Card; skills may not transfer to real world where IC must prepare a sketch range card.

TANGET(S)	Perfora/	Every	I,	Postetive	
Part 3.1 Soarca for Target(s)	Practice?	[]ement?	Ĩ	Trens/Cor?	Compets
Option 3.1.1. Search open hatch - day	dey				
SIMMET does not simmlate open-hatch viewing conditions.	tch viewing c	onditions.			
		•		•	
Option 3.1.2. Search closed hatch - day	1 - day				2-TC turret is rotatable through only 300°.
Search 360°	YES	2	2	2	3/4-Accomplished by rotating turret instead of head; this slow and cumbersome process may confuse experienced TCs.
Perform air guard duties	£	Æ	9	9	3/4-No air targets at present; student TCs may lears to ignore this element.
Execute search techniques	Ţ	ÆS	ž.	TES	
				1	
Option 3.1.3. Search at night					
SIMMET does not simulate night viewing conditions.	leving condit	:tons.			
		•			
Part 3.2. Detect/Locate/Identify Target(s)	Target(s)				
<pre>Detect target(s)/signature(s)/ obstacle(s)</pre>	Ð	2	₽	ž	2-No target signatures other than dust and smake from other webicles. 3-Nost obstacles have little or no effect on tank movement.
Locate target(s)	TES	£2	Æ	YES	
Identify target(s) by . IFFN	YES	YES	9	2	3/4-Easier than actual task due to color distinction (friend - broam/throat - green); expected transfer is mil.
* Nomenclature	YES	T.S	9	9	3/4-Easier than actual task due to the ligited array of threat targets (772, BPP); expected transfer is ail.
	š	š	Š	Š	

Coments	2-No truly "lease dangerous" targets, e.g., trucks, troops.		3/4-Range cues from SIMET displays are substantially different from real world; puts experienced TC at disadventage.						2/3-51MET does not simulate the following M1 weapons: the coax, the LDR's M240, and the TC cal .50. 2/3-51MET does not support most modes of degraded gunnery.			2/3-51MET does not simulate the following creuman/weapon combinations: LDR/M240, GMR/coax, and TC/CAL .50. 2-A simultaneous fire command is not appropriate.	
(4) Positive Trans/Cor?	YES	YES	2	TES	•	TES			AES.			ZŽ.	
	Æ	YES	9	TES	•	ž.			9			2	
Provide Comment if Respon (1) (2) (3) Perform/ Every S-R Practice? Element? Same?	2	YES	ž	TES	t 1 1	Ş			. ₽			2	
(1) Perfora/ Practice	YES	TES	YES	TES		3			ā			ž.	
Activity 3. ACQUINE TANGET(S) (cont'd)	Classify multiple targets as most dangerous/dangerous/ least dangerous	Confirm acquisition report	Estimate range to select weapon(s) and to evaluate LAF return	Send contact report to platoon leader	Part 3.3. Evaluate situation	Decide whether or not to engage contingent on: ' Plt mission	. Platoon fire plan	. Plt ldr comend	Select the appropriate weapon/ ammunition and the firing mode (precision/degraded) contingent on: Target range	Type of target (hard/soft, point/area)	Tenk status (ammo, malfunctions)	Determine crewmen (GNR, TC, LDR) and the type of fire commend (single, multiple, or simultaneous) contingent on: YES Wumber of targets	Target classification

Activity 4. ENGAGE SINGLE TAMER'S WITH THE ART (TWO THE OFFICE Element) See contact report: CONTACT -DIRECTION- TAMER'S Decide whether to employ tampet Authority of from a short halt, Issue driver command; CONTACT -DIRECTION- WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS WISS W	Coments		2/3/4-Since SIMET does not similate degraded mode gunnery, there is no reason to halt; students trained on SIMET may forget to make this decision.													
	(4) Posttive Trens/Cor	YES	9	ā	Ę	52	Ē	£	Ę	Ę	£	173	n gumery	5	5	ž.
	1f Respons	YES	9	Ş	£	252	Ę	TES.	Ş	Ş	TES	TES	a precisio	52	£	ž
	(2) Every Element?	ÆS	2	Ē	ŽŽ.	52	2	MES	Ę	Ş	¥5	5	fense us in	Ş	5	2
	(1) Perform/ Practice?	ÆS	Æ	MES	£	TES.	1 2	£	Ş	2	Ę,	1	from the de	ÆS	75	TES
	Activity 4. ENGAGE SINGLE TAMBETS WITH THE PAUR GAR Option 4.1. Engage single target	Issue contact report: CONTACT -QINECTION> <tanget></tanget>	Decide whether to engage target while moving or from a short halt	If engaging from a short halt, issue driver command: DRIVER STOP	Relay any action drill commend	Issue fire commend: GJMHER	Lay gun (simultaneous with fire commend)	Release override		Evaluate range display	Listen for UP	Announce FINE, or FINE, FINE -ALTERNATE AND-	Option 4.2. Engage single target	Issue contact report: CONTACT -OINECTIONS <tangets< th=""><th>Issue fire comend: GRMER </th><th>Annience DRIVER HOVE OUT, GAMER TAKE OVER</th></tangets<>	Issue fire comend: GRMER	Annience DRIVER HOVE OUT, GAMER TAKE OVER

Comments													1-80 ce) ,50.						
Provide Comment of Response is 10 1) (2) (3) (4) formy Every S-4 Positive cticel Element Some Trens/Cory	5	ā	MS	ş	45	ş	•				12	Ē			15		22	5	
EI	Ş	ş	¥	ğ	ES.	Ş					£	Ē			Ş		Ş	Š	
	£	Ş	5	Ş	TES	\$		urget	3		E E	T.			TES TES	et()	5	25	
Treation of the state of the st	5	Ş	2	Ţ	ħ	Ē		77 -	actify torse	=	5	Ş	8		5	servect ten	Ş	Ş	
Activity 4. ENCAGE STRUCE TAMBETS MITH THE PAUR GRR (cont'd)	Lay gen (similtaneous with fire commend)	Release override	Sight through GPSE	Eveluate range display	Listen for W	Assessor FIRE, or FIRE, FIRE -A. TERMATE AND-		Option 4.3. Geneer cannot identify annuanced target	Case 4,3.A.; Genner fails to identify target(s)	Direct gameer onto target using one of the following techniques: ' Verial comment: Thirties.	AEFT or NIGHTS, STEADY, OR	ž.	Assessed WATCH IN TRACERS and use .50 caliber tracers to point to target	*	Amounce FNOH NY POSITION and preced with TC engagement (see Activity 10) YES	Case 4.3.8. Gunner identifies incorract target(s)	If GUM is correct, issue a correction to the fire command YES	If GRM identifies the urong torget, treat as Case 4.3.A. and proceed	

	Provid	Comment	If Respons	e 1s m
Activity 4. ENDINE STIMLE	ε	(2)	3	3
TAMETS WITH THE	Perform/	[mary	I	Pealtine
MATH CHE (COST. 9)	Prectice?	[lement?	3	Trens/Cor?

Option 4.4. Engage target using 715

SIMET does not simulate thermal optics viewing conditions.

G-6-7

Comments	2/3-fecoil is not similated.		3/4-SIMET uses coded graphs for different eyes of types of hits.		3-Poor reage cues.							
(a) Positive Trees/Corl	Ę	ē	8		Ş	Ę				5		22
Provide Comment of Response is NO	2	ş	8		8	ş				5	#5	YES
E Committee	8	Ş	ž.		Ą	ž				TTS TTS	YES	ZŽ.
(1) Perfora/ Prectice?	ĕ	Ş	3		T.S	£	: :			Ě	Ž	Ž
		Oserve strike of round	If IABEE was observed, determine whether or not target was destroyed	Option 5.1. Use reengage technique	Evaluate range display		Option 5.2. Use standard ad Justinent	No TC actions specified	Option 5.3. Use TC edjustment	Issue subsequent fire commend to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	If target is destroyed or exposure too long, commend GASE FIRE	If in defensive posture, command DRIVER, DACK UP

Activity 6. ENGAGE A SINGLE TANGET WITH THE CDAI SPHET does not similate coax engagements.

	Provid	e Comments	1f Bespon	e Is no	
Activity 7. ENDINE NATTHLE TABLETS WITH THE MAIN GAR	(1) Perform/ Practice?	E very	ea j	(3) (4) S-R Positive Semp Trans/Cort	Comments
GUMER <4900 <4090RD <1840GTD <1840GTD <1840GTD <1840GTD <1850T \REST	WS WS	Ş	5	ž.	
Engage first target using precision gummery (Option 4.1 or 4.2)					
If first target is not destroyed, adjust fire (Activity 5)					
If first target is destroyed, amounce -HEXT> IAMET	Æ	Ş	Ð	Ş	
[Continue until all targets are destroyed]					
Annumer (EASE FIRE	ā	TES TES	Ē	2	

Activity B. ENGNE TANETS
WITH THE CAL. 59
(INCLINOTHE SPACETANETHE WATH GAN
ENGARDERITS

Siffer does not similate cal .50 engagements.

Coments			3-MPIO SELECT has no effect on 85 range; for either Sabot or MEAT, the displayed range is 1200 meters.	sys-kampe caes in simuli are sobstantially different from real world; puts experienced IC at disadvantage.									3/4-Range cues in SIMMET are substantially different from real world; puts experienced TC at disadvantage.			
(e) Positive Tress/Cor?		52	Š	9	ž	ZŽ.		•					8	YES	Ž	
Provide Comment if Response Is NO (4) (4) (4) (4) (4) (4) (6) (6) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7		Ş	2	9	Ş	TES					•	벌	9	Ę	£5	
(2) Every Every	Summer.	ž.	Ş	5	52	T.			2			turns from	#S	ÆS	465	
(1) Practice?	batt les ight	ÆS	EZ.	Ş	žž.	£			faeffectiv	tve LUF.	•	mitiple re	MES	Ş	ž	
Activity 9. ENGAGE TANGETS USING DEGLACED GAMERY TECHNIQUES	Option 9.1. Engage targets using battlesight gunnery	Issue fire comments CONNER BATHLESCOTT «TARGET»	Depress Would, NAGE BATTLE SGT button	Estimate range to target	If target cutside of \$200 meters of battlesight range, enter range change using IVMI RIG 8/5 ACO DAOP topple switch	Check range readout in GPSE	Engage target using practition genery (Option 4.1 or 4.2) but <u>vithout</u> evaluating LIF display		Option 9.2. Engage targets given ineffective LNF	SIMET does not simulate ineffective LIF.		Option 9.3. Engage targets given multiple returns from LMF	Estimete range	Evaluate range display	If range appears incorrect, may instruct GM to switch LMS setting from AM LAST ATH to AMM IST ATH or v.v.	If multiple return symbol appears in GPSE and displayed range is outside ½ 200 m of estimated range, take either one of the following actions:

Coments				
Activity 9. ENGAGE TANGETS (1) (2) (3) (4) USING DECLANDED GENERAT TECHNIQUES (cont's) Case 9.3.A. Gamer relases Amounce RELASE Correct range using NAN RMG B/S ADJUMOP toggle switch If displayed range is within	SIMET does not similate loss of symbology.	SIMMET does not simulate crosswind sensor failure. Option 9.6. Engage target given cant sensor failure.	Option 9.7. Engage target given lead angle sensor failure.	Option 9.8. Engage target given GPS failure (day channel). SIMMET does not simulate thermal channel viewing conditions.

beton \$.11. frage target alone stabilitedim system failure (to emergent me appear to 0% sight on a result of 0% follore. Software problems briginal plans for SPMET called for GAS reckib to extensively Case 5.5.5. Index collimated range and the precision passery system to epocite to emogency embs. Software problems present this extine being exed at present. Prignal plan for SMET called for statestic of statistical to system follows and for the five control failes \$.12, frame termit gives turned power failbers Section 9.9. Coppe terror gives 95/715 feilber present this aption from being east of present. SMET den est statiste turnt pader follung densal controls ere net provided. harps cannot be indemed to balllette compatier. ferine 9,10. Course terret mine 645 L Case 9.2.5. See belifentget gemen Copage Larget ontog bottlesignt germany (Botton 9.1) STREET GARS AND PROVIDE COS. Core 9. 9.4. Cre 445

Innes/Cort

(1) (2) (3) (4)

(1) (2) Perfore [nery Prectice] [hemes]

STREET NORTHERN

(F. 3000)

ACTIVITY D. CHONE THEFTS STIES SECURITY

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81]			=			H	•	2	F	=	=	=	Ħ	=	9	
13			¥			F	F	2	=	=	2	2	-	2	2	
(1) (2) (3) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4		leret	NS 75 TS			-	=	E	=	2	SE .	-	-	72 TO 12	ē	
Activity 14. COME THEFT FROM N. V. PASTINE (Also Three See Com Experents)	line on of the following fire	Gen 18.A. Somer spreet sheetify target	FEB 4 451115	•	Cos 16.A. Three-up one (w GE)	-	Contacts range to Larger	life thank Bill	lay as contar assis of tarpet	Supras tes Balles	Contacts reage Chapley	Made control tay	Assesses (3 74 mg	Specie trigge	Manager Claff Flat	
									3		• •					

	2/3-dumps in creatly all or section, although a mability bill is possible;	Inferioral completes are and pass with.										
(3)	2		E.		P		2	110	ä	2	8	
Ezj	8		F		ş		=	=	=	=	2	
	8	- 1	TI III		2		E .	TIS TIS	73	N N N	22 22 22	
	F	9	F		=		13 15 II	Ħ	F	2	ş	
Attivity 11. ACM 35 GOM 15.	Acres bottle design/	Determine if and has over sharid to recognited to fight to a time-was configuration	lum sette	Gre II.A. If the 1s stathmery	between detire to men to primary, electeds, or supplementary firity position 155 155	Gare 11.8. If took is seving	Determine charges to resto	lies ofter camera	Mirrolin agrapticio am for orikipated terpiti	America PEPAK BUTICARY	frice battlegary rapp oring the count, battle set angues taggle maten	

CALMITOR OF SPIRIT OR LOGGE ACTIVITIES

Committee	1-th created sense.	1-de Lift's meditems.	214	2-Descriptor does not an examinately off. 2-Descriptor to pointed to GT position. 2-Descriptor to pointed to GT position. 2-Descriptor to pointed on crow compartment doer with molicious to following positions: 3-Descriptor to pointed on crow compartment doer with molicious to following positions: 3-Descriptor to pointed on crow compartment doer with molicious to following positions: 3-Descriptor to pointed on crow compartment doer with molicious to following positions: 3-Descriptor to grant descriptor descriptor to grant descriptor de	of transfer is all.	Adder witch as cable prostitutes for 3-position switch on belong.	1-to (27's platform.	1-8s (AT's beich.	into the state vista vigar.	1-46 (M's morth. 2-ferret blaner suftra is politica is Off positible. 2-ferret shaner suftra is politica is Off positible. 2-ferret shaner suftra is sufficient to the sufficient sufficien		2-Des set operate le memol mete.	Debut special to represented by similated sound and anno indicator lights coming on. Advisorably is so unlike extend test that especial transfer is nil.	1-the temi-roody demonstrates door.	1-No hall commostion door.	1-Comet perfers on part of this preceders.
Tanker Tanker	1	١		2		=	١	1			8	Î	8			
51	İ	İ	ĺ	•			İ	ĺ	İ		8	İ	8	ĺ		Ì
There is a constitution of the constitution of	i	İ	İ	-		9	İ	İ	j	İ	8	j	2	İ	İ	İ
(3) (2) Parties County			8	=	ū	E	8		8	8	113	8	12	8	2	2
CATANT 1. PROPER STATES	rect creaming sensor	miell (Br. e mebluge	mer 1871 status		wer so Life's starten	persis interces	about 158's seat/platform	abor 138.1 bets	misliciace LBF's orget visios riener	tiring	perate 1981s panel	perate turnet tracerse lack	deer to enta/manual mades	Sperate seal-ready amount ton	Sperate hall amountion duer	iter 16fm emetities

		2-Canact close breach manually with weeden black. 3-Spring-loaded taggle switch represents opening/closing breachblock. 4-Procedure is so unlike actual task that expected transfer is mil.]-Ho raplenisher.	1-No coaxiel mechinogens.	1-Cannot perform any part of this procedure.	3-Status shown by ready reck indicator laws.	3-See detailed comments on loading under precision gannery.				2-Limited to closed-batch viewing through periscopes.
(5)	Positive Trens/Cor?	2				Æ	8		2		ğ
(£)	Į I	8	1			2	2				Ş
(1) (2) (3)	Practice? Element? Sent?	YES 80 80				Ş	Ş	•	TES TES TES		YES IID YES
E	Prectice?	Ş	9	2	9	Ş	Ť.	•	Ę		Ş
	Activity 2. FORUM PROME- TO-THE ORDES	Operate min pen broacibleck	Check replanisher	Cleer/load coaxiel machinegus	Fill ready rack	Report arms status	Land battlecarry arms	Option 2.1. Prepare for offense	Receive TC briefing VES VES VES	Option 2.2. Propers for defense	Inspect terrain to flonk/rear

	M4-Turret-to-Mull reference display cannot be easily viewed from LDR's position; may present problem for experienced LDR.	om moving veh
Provide Comment if Response Is ND (1) (2) (3) (4) Perform Every S-R Positive Activity 3. Activity 3. Activity Part 3.1. Search for Target(s) Option 3.1.1. Search open hatch - day SIMMET does not simulate open-hatch viewing conditions.	sarch right front counter- clockwise to right rear YES YES NO tecute search techniques YES YES YES tecute search techniques YES YES YES tecute search at night tion 3.1.3. Search at night	Detect target(s)/signature(s)/ Obstacle(s) Locate target(s)/signature(s)/ Obstacle(s) Locate target(s) Identify target(s) making the following determinations: 'IFFN 'nomenclature LOAGER REPORT (TARGET) (LOCATION) Part 3.3. Evaluate Situation NO LDR actions specified

	Provid	Provide Comment 1f Response Is MO	f Response	Is no	
ACTIVITY 4. ENGAGE STRALE TANGETS UTTH THE PAIR GAR	(1) Perform/ Prectice?	(2) Every	e z j	(4) Positive Trens/Cor?	Comments
Option 4.1. Engage single target from the offense using precis	from the of	Tense us Ing	precision g	guenery	
Drop down into turret	Q	İ			1-W/A since SiPMET simulates closed-hatch mode only.
Check turnet ring	9	İ			1-No turret ring.
Set GUM/TURRET DRIVE switch in EL UNCPL position	TES	2	9	2	3/4-Does Not return to power mode upon arming main gum, and gam will not fire unless in power mode; since gam tube does not move in STWET, LDR can leave switch in FOMENED; possible source of negative transfer.
Case 4.1.A. Announced round is not loaded	L loaded				
Move ejection guard to SAFE	Ē	¥£S	2	Ş	3-Ejection guard is represented by toggle switch.
Ensure SAFE 11ght 1s 11t	ÆS	Ę	Ę	YES	3-Scoreable only if SAFE light is not lit.
Open breech	TES	ĕ	£	2	J-pring-loaded toggle switch represents opening/closing breachblock. 4-Procedure is so unlike actual task, expected transfer is nil.
Remove incorrect round from chamber, if necessary	TES	ZĘ.	S	2	3-Accomplished by pressing red load button on gun tube. 4-Procedure is so unlike actual task, expected transfer is nil.
Open armo doors	YES	TES	ÆS	TES	
Stow unwanted round, if mecessary	TES	YES	₽	9	3-Accomplished by pressing unlit ammo indicator on ready rack. 4-Procedure is so unlike actual task, expected transfer is uil.
Remove correct round from stonage	Ð	22	2	2	3-Accomplished by pressing desired ammo indicator on ready rack. 4-Procedure is so unlike actual test, expected transfer is nil.
Load desired round	YES	ĘĘ.	2	2	3-Accomplished by pressing red load button on gam tune. 4-Procedure is so unlike actual task, expected transfer is mil.
[Continue with Case B:]					
Case 4.1.8. Announced round loaded	ěi.				
Move ejection guard to FIRE	ĘŞ	Æ	9	TES	3-Ejection guard is represented by a toggle switch.
Clear recoil path	YES	£	9	₽	3/4-Since there are no negative consequences associated with not cleaning recoil path, LDR may acquire bad habit
Announce UP	£5	Ę	¥5	ž	
Open sumo doors	TES	YES	MES	TES	
		:			

Coments		1-N/A since SIMMET simulates closed-hatch mode only.	1-bo turret ring.	s/4-woes not return to power more upon erming main gam, and gam will not fire unless in power mode; since gam tube does not move in STWET, LDR can leave switch in POMERED; possible source of negative transfer.		3-Ejection guard is represented by toggle switch.	3-Scoreable only if SAFE light is not lit.	3-spring-tooces toggle switch represents opening/clasing breamelock. 4-Procedure is so unlike actual task, expected transfer is all.	3-Accomplished by pressing red load button on gun tube. 4-Procedure is so unlike actual task, expected transfer is nil.		3-Accomplished by pressing unlit ammo indicator on ready rack. 4-Procedure is so unlike actual test, expected transfer is nil.	3-accomplished by pressing easited ammo indicator on ready rack. 4-Procedure is so unlike actual task, expected transfer is all.	3-accomplished by pressing red load button on gen tube. 4-Procedure is so unlike actual test, expected transfer is nil.			3-Election guard is represented by a toggle switch.	My-since there are no regative consequences associated with not clearing recoil path, the may acquire bed habits.		
(4) Positive Trans/Cor?	gunnery	İ		9		£	žį.	9	9	MS	9	9	9			£	2	YES	YES
Provide Comment if Response 1s NO 1) (2) (3) (4) (4) (7mm/ Every S-R Positi ctice? Element? Same? Trans.	precision 9			9		2	Ş	2	2	ZZ.	9	2	2			2	2	Ž	SŽ.
(2) Every Element?	fense using	j	j	řŠ		Ę	Ş	Ę	ž	Ţ	ř	<u>ş</u>	£			Ş	ĘĘ.	Ę	£
Provide (1) Perform/ Prectice?	roe the del	8	9	YES	loaded	TES	£5	MES	22	MES	ÆS	YES	YES			MES.	TES	YES	TES
Activity 4. ENGAGE STRUCE TAMBLES WITH THE WALK GAR (cont'd)	Option 4.2. Engage single target from the defense using precis	Drop down Into turnet	Check turret -ing	Set GUM/TURNET DRIVE switch in EL UNCPL position	Case 4.1.A. Announced round is not loaded	Move ejection guard to SAFE	Ensure SAFE light is lit	Open breech	Remove incorrect round from chamber, if necessary	Open amo doors	Stow unmanted round, 1f necessary	Remove correct round from stowage	Load destred round	[Continue with Case B:]	Case 4.1.B. Announced round loaded	Move ejection guard to FIRE	Clear recoil path	Announce UP	Open ammo doors

Coments					
Is NO (4) Positive Trans/Cor7					
Provide Comment if Response Is NO (1) (2) (3) (4)					tions
Provide Comment if Respon (1) (2) (3) Perform/ Every S-R Practice? Element? Same?	larget				eving condi
Provide (1) Perform/ Practice? E	Option 4.3. GM cannot identify announced target			SII MI	SIMMET does not similate thermal channel viewing conditions
. ENGAGE STRICLE TANGETS WITH THE NATH GAN (cont'd)	sanot Identi	sciffed	•	Option 4.4. Engage targets using TIS	imlate therm
Activity 4. ENGAGE SINGLE TABGETS MITH MAIN GAN (cont'd)	3. GM.	No LDR actions specified		.4. Enge	ses not s
Activity	Option 4.	No LDR ax		Option 4	SIMET &

	Provid	Provide Comment 1f Response Is NO	If Response	Is #0	
	(1) Perform/	(2) Every	ĒĮ	(4) Posteive	
Activity 5. AQUIST FIRE	Practice?	Element?	Ĩ.	Trans/Cor?	Coments
Set GUM/TURRET DRIVE switch in EL UMCPL position	ZE.	YES	22	ÆS	3/4-Does not return to power mode upon arming main gan, and gan will not fire unless in power mode; since gan tube does not move in SIMMET, LDR can leave switch in POMENED; possible source of negative transfer.
Load announced round (Case A, Option 4.1)	TES	ā	9	9	3/4-See detailed comments on loading under precision gunnery.
Move ejection guard to FIRE	TES	¥.	9	£	3-Ejection gward is represented by a toggle switch.
Clear recoil path	TES	MES	2	9	Mars increase are no regality consequences associated with not clearing the recoil path, List may acquire bad habits.
Announce UP	TES	YES	MES	YES	
Option 5.1. Use reengage technique			!		
No LDR actions specified					
		1			
Option 5.2. Use standard adjustment	tnent				
No LDR actions specified					
	•		:		
Option 5.3. Use TC adjustment					
No LDR actions specified					

ENCAGE A SINGLE (1) (2) (3) (4) TAMER WITH THE Perform Every S-R Positive COAK COAK	SIMMET does not simulate coax engagements.	ENCAGE MALTIPLE TANGETS WITH THE PAULH CHR	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	If first target is not destroyed, perform LDR's actions as described in Activity 5	Perform LDR's actions as described in precision gennery (Option 4.1 or 4.2)	ENGAGE TANGETS WITH THE CAL50 (INCLUDING STAIG. TANGOUS WAIR GAR ENGAGEBRITS	SIMET does not similate cal .50 engagements.	ENSAGE TAMETS USING DECANAGED CHIERY TEDINIQUES		Perform LDR's actions as described in precision gumery (Option 4.2)
Activity 6. ENGAG A SINGLE TANGET WITH THE COM	SIMMET does not simulate co		Perform LDR's actions as descrigumnery (Option 4.1 or 4.2)	If first target is not desi actions as described in	Perform LDR's actions as descr gunnery (Option 4.1 or 4.2)	Activity 8. DIGNEE TANGETS WITH THE CAL: (THICLUDING STATE TANGOUS WAIR G ENGAGEBRITS	SIMMET does not simmlate c	Activity 9. ENGAGE TANGETS USING DEGRAZED CUMENY TECHNI	Option 9.1-9.9	Perform LDR's actions as descrigumenty (Option 4.1 or 4.2)

Activity 10. BIGAGE TANGET FROM THE TC POSITION	Provide (1) Perform/ Practice?	(2) Every Element?		(4) Positive Trans/Cor?		Coments	
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)							
Activity 11. ASSESS RESULTS OF BRICADERT							
Check replesisher reservoir	9				1-No replenisher.		
Remove spent casings	2			-	1-No spent casings.		
Load announced round as described in precision gummery (Option 4.1 or 4.2)							
Announce loading status	YES	YES YES	YES	TES			

APPENDIX 6-8 EVALUATION OF SIMET ON DRIVER ACTIVITIES

Provide Comment if Response Is NO

	::	2	Ē	Ξ	
Activity 1. PREPARE STATIONS FOR OPERATION	Perfora/ Prectice?	21	Ę	Positive Trans/Cor?	Comments
Enter DW's station	9				1-Enter SIMET DVR compartment through fell-length door at side.
			ļ.		2-No hall networks box. 2-No hall power distribution box. 2-No parting brake system bydramite pressure gage. 3-The following switches on the DMR master panel are painted in the OFF position, and the corresponding indicate lights are painted on: PERSONNEL MEATER WINGER FEMISCOPE 6-65 PARTIC FILTER BILLE PANE . STOCK EXMEDIATE STOCK EXME
Power up hell systems	5	2	2	2	is mil, 2/3-lio rad filter.
Operate domelight	TES	2	9	2	3-Done light does not go completely off.
Check turnet seal Operate intercem	5 ž	Š	2	ž	1-No tarryt seel. 3-Noodset/boom unite are used instead of CVC belumt. 3-Nocher switch on cuble substitutes for 3-position switch on belumt.
Adjust seat/periscopes	임				1-Sout/periscopes are not edjustuble.
Adjust hatch	2				1-He hatch.
Adjust steer/throttle centrol	2				1-Steering/throttle control is not edistuble.
Operate drain valves Start engine	9 9				1-No drain valve. 2-ABORT light is painted on; aborted start procedures cannot be performed. 3-PUSH TO START button does not have to be held in for 3 secs. to start.
Make after-start checks	ž	9	٩	TES .	2-Presults of dominity does not occur. 2-No parting brake-system hydraelic pressure gage. 3-Parting brake release handle is represented as a toggle switch below DVR master panel. 3-PANKING/SERVICE BRAKES 15pht does not come on after helding service brake for 2 minutes. 3-Parting brake can be engaged with a short tap of the foot.

1	98.60
YES YES <th>i</th>	i
VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES VES	1
YES YES YES YES YES YES YES YES YES YES YES YES YES YES YES YES NES YES YES NES YES YES NES NES YES NES NES	i
YES YES YES YES YES YES YES 3/4-because first YES YES NO NO 3/4-because first YES YES NO NO 3/4-because first YES YES NO NO 3/4-because first YES YES NO Alfficialt th	
YES YES YES YES 3/4-because first YES YES WES 3/4-because first YES YES WES	
YES YES YES	i
TES TES TES TES TES TES TES TES TES TES	
t between primary firing positions YES YES NO NO NO NO NO NO NO NO NO NO NO NO NO	
firing positions YES YES NO NO NO NO NO NO NO NO NO NO NO NO NO	1
ing positions YES YES NO NO	2
3	1
ו ו	TES TES

ACTIVITY 3. ACUSTRE TANGET(S)	(1) (2) Perform (very Prectice) (Nemet)	Coat Coat	ea j	(d) Pasitive Trees/Cort	Commoto
Part 3.1. Search for Torquet(s)					
Option 3.1.1. Search open hetch-day	•				
SIMET does not similate open-betch canditions.	Act condition	ż			
Option 3.1.2. Search closed batch-day	CD				
If maying, fellow wingums concept/ react to formation changes	\$ \$	7.53 00	8		Netherms SHET tens on tentical with as distinguishing features, this cleant to may difficult than real-orte test, me case probles for especienced PMs.
Search feeder to feeder	2	F	¥	E C	
Execute search techniques	F	E	73 73	ZŽ.	
		•		•	
Option 3.1.3. Search at aight					

SHEET does not similate night viewing conditions.

		2-th target objective other than deat and make from unbicks. Administration have filled affect to last general,			No-design than extend took due to color distinction (friend - prose/thread - grown);	Ministrator than extend took due to the funded erroy of threat Largest (177, CPT); expected (residue to all),		Markey and comparison are efficient to determination better my cases and bear for exercised indi-	Per 1.1. Columb Structus		
(S)		g.	Ħ		8		F	•			
Ezi		8	THE STATE OF		8		=	9	•		
			Ħ		2	2	=	=	•		
(1) (2) (3) (4) (4) (4) (5) (4) (5) (5) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	Town(s)	12 a	12 - 15 - 15		12 TS 8	75 TO 8	10 10 10 II	72			
Activity 3. ACRIME TRANSICS) (cost's)	Part 3.2. Detect. Accounting Torque(s)	Detect terpet(s)/signature(s)/ detecte(s)	Lecate terper(s)	Sentify target(s) and tog the following determinations:	E	. manuel latura	If tarpet detected, personne touch mount, stante, election	Embets cover and concustance	7.1. F	to driver actions specified	

Comments				No. Teached att. territo and but of one builties also this and relativity conv. conclud transfer is all.		N-Contactor town tens second topics to determine the to real world; may had to ignoring/forgetting.				Marine mater misses back in represented by a teach parties.	
E CENTRAL DE LE CONTROL DE LE		=	2	8	E			Ħ	122	=	THE STATE OF
(1) (2) (3) (3) (4) Performance (normy 1-4) Performance (normy 1-4) Performance (normy 1-4) Performance (normal performance (n	1	2	F		8			2	N.		THE STREET
	les n	71 TI TI	T T T	77 TI 80	11 11 11	n n	ten se	THE THE	TI III	=	70 70
	2 80 80	Ħ	F	H	Ħ	B	7 an 1 an 6	H	E	E	F
Activity 4. (Note: Street Limits are to make the	beiten 4.11. Course sturbe larget frem the geffenen erter grant ten	Restler TC and platess business	If TC americas MLT, stap marchly	If TC does and announce INCT. Mistals standy platform	If settled five is excessioned, set cours and concessioned or excession action action action.	Abert cree of desirches	Beiten & E., france study termed from the defense on the securities	Set technol. But metics to the position	Set transmission control to 0	Chiese parting brake	Depress service brake

Ordina 4, 3, Old connect them; 15; personnel target

Mediter buil defiliet perities genet in confirme in MR der to lech of telescope; my lean had notice

8 2

T11 B

New to buil defibes position let transmission control to 0 depressional service brase

2

= =

2 2

413

to driver actions specified

Ter ton 4.4. Empire terper ming Till.

SHALL does not alsalide thermal aptice electing conditions.

Comments	Marillan and elterwise smillians are difficult to identify; my to difficult for emeriment PMs.			
(3) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	9 9			
(1) (2) (3) (3) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	۳ - 	į		
Activity & Asset Fiel	Attent to defiliate or seat alternate position	Activity 6. CROSE A STREET UNITED STREET CROSS STREET STRE	Activity). Comme marthal transfer of the comments of the comm	Activity & Comme towards organization of the comme

fronting Comment of Anneans in 10 (1) (1) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4		d is precision genery	45 45 46
Activity 9. Grade thank miss furfaced (19) (2) (3) Activity 9. Grade thank miss furfaced (19) (4) (2) Thomspace for the first of furfaced (19) (2) Active 9.1-6.2 Perfers DM's actions on described to precision permety (Option 4.1 or 4.2)	Option 5,1875,11s. Cases terms given stabilization pro- Perfore DRT's actions as described to practicion pannery (Option 4.1 or 4.2) Step semethy William deliving William deliving	Activity 16. Chical Tradit run THE TE POSITION Furfers DM's actions as described in precision passery (Option 4.1 or 4.2)	Activity 11. ASSESS SENATS OF CHANDENT Bespond to TC Oriving commons

APPENDIX H

SUMMARY OF INSTRUCTIONAL FEATURES IDENTIFIED IN RESEARCH LITERATURE

APPENDIX H
SUMMARY OF INSTRUCTIONAL FEATURES IDENTIFIED IN RESEARCH LITERATURE

Instructional Features	Functional Definition	Training Purpose(s)	References
Total System Freeze	Stops all parts of a training scenario.	Permits part-task training by segmentation of lengthy tasks; basic simulator control feature.	1, 2, 3, 4, 5, 6, 7
Melfunction Control	Inserts simulated melfunctions within training scenario.	Permits training on emergency procedures and under degraded conditions.	1, 2, 3, 4, 5, 6, 7
Simulator Record/Replay	Records and replays actions and inputs that occurred during performance.	Provides performance feedback information.	1, 2, 3, 4, 5, 6, 7
Automated Simulator Demonstrations	Presents prerecorded manuever.	Provides a model of performance.	1, 2, 3, 4, 5, 6, 7
Initial Conditions	Presets initial values of environmental and vehicle parameters.	Saves instructor setup time; basic simulator control features.	1, 2, 3, 4, 6, 7
Kerdcopy/Pr Intout	Produces paper copy of performance data.	Provides performance feedback information; documents performance of students and system.	1, 2, 3, 4, 5, 7
Automated Performance Measurement	Records and processes quantitative student performance information for interpretation/diagnosis by instructor.	Provides performance feedback information; is prerequisite for other features related to performance measurement.	2, 3, 4, 5, 6, 7
Briefing Utilities	Presents information related to upcoming exercise; may include information on past performance.	Provides preview of upcoming exercise; provides "delayed" performance feedback information.	2, 3, 4, 5, 6, 7
Scenario Control	Configures and controls simulated events according to a specific training scenario.	Saves instructor setup time; basic simulator control feature.	2, 3, 4, 5, 6, 7
Parameter Freeze	Freezes any aspect of flight system.	Permits part-task training by fractionation of time-shared tasks.	1, 2, 4, 5, 7
Tutor ia i	Presents information concerning training objective or capabilities of simulator.	Provides basic/remedial instruction or on-line "helps."	2, 3, 5, 6, 7
Remote Instructor/Operator (I/O) Station	Displays current student performance information to the instructor.	Permits on-line monitoring of student performance.	1, 2, 3, 6, 7
Automated Adaptive Training	Adjusts the exercise degree of difficulty according to the student level of performance.	Provides adaptive instruction.	2, 4, 5, 6, 7

Instructional Features	Functional Definition	Training Purpose(s)	References
Autometed Controllers	Presents information from external source (e.g., flight controller, higher HQ) as required.	Provides training on tactical tasks where such information is required.	2, 4, 6, 7
Automated Performance Alerts	Provides auditory or visual alert when performance tolerances have been exceeded.	Provides on-line performance feedback for tasks that lack intrinsic feedback.	2, 4, 6, 7
Closed Circuit Television	Monitors and records student behaviors.	Permits on-line monitoring of student behavior that would otherwise be unobservable; provides performance feedback on those behaviors.	4, 6, 7
Computer-Hanaged Instruction	Automates instructional management functions.	Offloads instructor tasks; permits "instructorless" training.	2, 6, 7
Automated Cuing and Coaching	Presents appropriate coaching message if performance tolerances are exceeded.	Offloads instructor tasks: permits "instructorless" training.	2, 6, 7
Computer-Controlled Adversaries	Simulates actions of adversaries.	Permits training of tactical tasks where adversaries are required.	2, 6, 7
Graphic and Text Readouts of Controller Information	Provides real-time information about simulated aircraft/vehicle's situation; analogous to flight controller information.	Provides instructor information about situation that could not be inferred from other sources.	2, 6
Flight System Freeze	Freezes flight system while leaving all other systems operational. $^{\theta}$	Permits part-task training by fractionation of tasks having procedural component.	5, 7
Remote Graphics Replay	Provides a post-mission graphic and dynamic recreation of training exercise.	Provides performance feedback where student must view performance in context of entire situation.	3, 7
Deta Storage and Analysis	Stores, analyzes, and retrieves archivel data on individual students, group of students, or the simulator itself.	Provides "delayed" performance feedback to student and program evaluation data for the entire system.	3, 7
Position Freeze	Fixes latitude and longitude while (flight) simulator continues to "fly" (nowhere).	Reorients students who are temporally overwhelmed by task.	5, 7
Procedures Monitoring	Monitors and records discrete responses of students.	Honitors student performence on and provides performence feedback for nomal and emergency procedures.	3, 7

Instructional Features	Functional Definition	Training Purpose(s)	Reference
Real-Time Simulation Variables Control	Inserts, removes, and otherwise alters simulation variables while simulator is in operation.	Permits spontaneous changes to training scenario; used in informal training situations.	3, 7
Automated Checkride	Administers and scores an evaluation on "a predetermined series of testing events.	Automates performance evaluation where a high degree of standardization is required.	4, 7
Reposition	Places aircraft/vehicle at any point in space that is relevant to training scenario.	Permits repetitive training of complex tasks.	3, 7
Automated Copilot/Crawmember	Simulates reactions of a copilot or other crewmember.	Permits training in crew interactions in the absence of crewmembers.	1, 7
Environmenta i	Varies environment conditions that presumably affect task difficulty.	Permits training under degraded environmental conditions.	5
Reset	Returns aircraft/vehicle to a stored set of initial conditions and parameters. §	Facilitates repetitive training.	5
Crash/Kill Override	Continues instruction without interruption following a "crash" or "kill."	Facilitates training where the probability of a crash or kill is high.	5
lot ion	Provides motion feedback.h	Provides training on tasks where students must learn to recognize/use motion cues.	5

⁸The numbers refer to the following references:

- (1) Caro, P.M., Pohlman, L.D., & Isley, R.M. (1979). <u>Development of simulator instructional feature design guides</u> (TR 79-12). Pensacola, FL: Seville Research Corporation.
- (2) General Electric (1983). Training device requirements analysis report, Institutional Conduct of Fire Trainer (I-COFT), Volume II:

 Appendices (Contract No. N61339-83-C-0038). Daytona Beach, FL: Author.
- (3) Logicon, Inc. (1985). Instructional support feature guidelines (AF Contract No. F33615-84-C-0054). San Diego: Author.
- (4) Hughes, R.G. (1979). Advanced training features: Bridging the gap between in-flight and simulator-based models of flying training (AFRL Tech. Rep. 79-52). Brooks AFB, TX: Air Force Human Resources Laboratory.
- (5) Pozella, D.J. (1983). Aircrew training devices: Utility and utilization of advanced instructional features (Phase I--Tactical air command) (AFRL Tech. Rep. 83-22). Williams AFB, TX: Air Force Human Resources Laboratory.
- (6) Semple, C.A., Cotton, J.C., & Sullivan, D.J. (1981). Aircrew training devices: Instructional support features (AFHRL-TR-80-58). Brooks AFB, TX: Air Force Human Resources Laboratory.
- (7) Sticha, P. J., Blecksten, H. R., Knerr, C. M., Morrison, J. E., & Cross, K. D. (1986). Optimization of simulation-based training systems, Volume II: Summary of the state of the art (HumRRO Final Report 86-13). Alexandria, VA: Human Resources Research Organization.

^bThe Initial Conditions feature is sometimes viewed as a subfeature of Scenario Control (Logicon, 1985).

Cparameter Freeze is sometimes used synonomously with Flight System Freeze but is actually more general than the latter feature.

dautomated Cuing/Coaching is similar to Performance Alerts feature but includes information to the student on the correct course of action.

^{*}Reposition prevents the student or instructor from having to take time to "fly" to a particular point.

^TEnvironmental simulation is usually regarded as a fidelity rather than an instructional feature.

Reset is sometimes considered as a subfeature of Initial Conditions feature.

^{*}Motion simulation is usually regarded as a fidelity rather than an instructional feature.

APPENDIX I

EVALUATION OF PERFORMANCE TESTING CAPABILITIES OR ARMOR TRAINING DEVICES

APPENDIX I EVALUATION OF PERFORMANCE TESTING CAPABILITIES OR ARMOR TRAINING DEVICES

CONTE	MTS	
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1-2	TESTING CAPABILITIES OF VIGS ON GUNNER ACTIVITIES	I-2-1
I-3	TESTING CAPABILITIES OF TOPGUN ON GUNNER ACTIVITIES	1-3-1
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APPENDIX I - 1 CODING SCHEME USED FOR EVALUATING TESTING CAPABILITIES

Table I ~ 1 Ratings used for element level descriptions of device testing capabilities

Column Heading	Symbol and interpretation
Measure Required	 K - Knowledge assessment Behavior assessment Outcome assessment - Used to join optional assessment modes (e.g. K,B = use knowledge or behavior assessment). K&B - Knowledge and behavior both required for diagnostic assessment. Outcome assessment can be used for proficiency assessment, but has limited diagnostic value.
Element [:presented	 Y - Performance of the element is expected to mirror performance on the actual equipment. (Y) - Performance of the element is sufficiently different from the actual equipment to reduce expected validity. Partial - Some portion of the performance requirements are not represented. Degraded - degraded stimulus conditions are expected to alter perceptual requirements for the element.
Automatic Recording Mode	 N - Element can not be performed sufficiently to score performance. B - Behavior is recorded or scored 0 - Outcome of the element is recorded or scored T - Elapsed time to element performance is recorded [Note: behaviors or outcomes of elements that are remotely displayed at the time of execution, but not captured for later review are not counted in this column]
Automatic Recording Feedback	Display - Occurrence of the behavior or evaluation of the outcome is printed or displayed on a monitor. Replay - Occurrence of the behavior or representation of the outcome of the element can be watched on a video replay of the performance.
Automatic Recording Storage	 L - Behavior or outcome records are "permanent" in the sense that they are not automatically erased/lost when the exercise or training session is over. S - Behavior or outcome records are displayed at the end of the exercise and then erased/lost.
Instructor Scoring	 K - Instructor can observe performance or a remote display of performance and score knowledge. B - Instructor can observe performance or a remote display of performance and score behavior. O - Instructor can observe performance or a remote display of performance and score outcome.
Element Testable -	 Y - Element can be scored either automatically or by an instructor. (Y) - Element can be scored, but reduced validity is expected. N - Element can not be scored.

Table I - 2 Ratings used for activity level descriptions of device testing capabilities

Column Heading	Symbol and interpretation							
Domain Testable	 Y - Elements are sufficiently represented to expect valid information. (Y) - Elements representation is somewhat degraded and information may have marginal validity. N - Element representation is sufficiently degraded to expect little test validity. 							
Composite Meaningful	Gives a short description of any activity level scores provided. Blank - No composite score is computed for the domain.							
Composite Storage	Gives a short description of activity level scores storage for long or short term access.							
Selection/Repetition	Describes device capabilities for selecting exercises, e.g. programming a particular sequence of engagements.							
Device Inconsistencies	Notes any characteristics that vary among devices and could affect performance scores							

APPENDIX 1 - 2 TESTING CAPABILITIES OF VIGS ON GUNNER ACTIVITIES

Activity 1. PREPARE STATIONS	Domain Composite Selection Device Testable Heeningful Storage Repetition Inconsistencies Comments
FOR OPERATION	<u> </u>
	Measure Element Autometic Recording Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comments
Enter gunner station	K,B,O R N
Operate domelight	K,B,O N N
Operate Intercom	K,8,0 N N
Install coax	K,B,O N N N
Adjust seats	K,8,0 N
Adjust broupeds	K,8,0 N N
Adjust chestrest	<u>K,8,0</u> <u>H</u>
Power up station	K,8,0 N N
Perform GPS function check	K,8,0 N
Adjust GPS	K,B,O N N
Perform computer self-test	<u>K,8,0</u> <u>N</u>
Perform computer data check	<u>K,8,0</u> <u>H</u>
Perform TIS check	<u>K,B,O</u>
Perform GAS adjust	K,8,6 N N N N N N N N N N N N N N N N N N N
Check power control handles	K,8,0 H H
Check manual elevation/traverse cranks	K,8,0 II II II II II II II II II II II II II
Perform load system check	K,8,0 H
Perform firing circuits check	K,B,O N N
Perform crosswind sensor check	K.B.O N
Perform hydraulic pressure check	K,B,O N N

Activity 2. PERFORM PREPARE- TO-FIRE CHECKS	Domain Testable	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
	Heasure Required	Element Automatic Recording Instructor Element Represented Hode Feedback Storage Scoring Testable Comments
Boresight main gun	K&B, (0)	
Zero coex	KAS, (0)	
Report weapon status ¹	K,B	
Index bettlecarry ammo on AMMO SEL switch	K,8,0	
Introduce battlecarry range into CCP	K,B,0	
Option 2.1. Prepare for offense	Done in	Composite Selection Device Meaningful Storage Repetition Inconsistencies Comments
	Heasure Regulred	Element Automatic Recording Instructor Element Generated Hode Feedback Storage Scoring Testable Comments
Receive TC briefing	<u> </u>	
	Domain Testable	Composite Selection Device
Option 2.2. Prepare for defense		
	Heasure Required	Element Automatic Recording Instructor Element Represented Hode Feedback Storage Scoring Testable Comments
Inspect terrain through GPS/TIS	K(K)	
Check GAS clearance	K,8,0	
Learn TRPs	<u> </u>	

¹ Outcome is TC knowing correct information.

	Demain Composite Selection Boyles Testable Measingful Storess Reportition Inconsistencies Comments
Activity 3. ACQUERE TARGET(S)	<u> </u>
Port 3.1 Search	
Option J.1.1. Open hotch - day	
	Domein Composite Selection Device Testable Panningful Storage Repotition Inconsistencies Comments
Option 3.1.2. Closed hetch - day	
	Measure Element Automatic Recording Instructor Element Required Represented Made Feedback Storage Scoring Testable Comments
Select 3X GPS/TIS magnification	
Search on gun axis using GPS	<u>K.B.O.</u> YB
Alternate using GPS with TIS	<u>E.(0.0)</u>
Execute search techniques to acquire targets	
••••••	Domain Composite Selection Device Testable Heaningful Storage Repetition Inconsistencies Comments
Option 3.1.2. Hight	
	Measure Element Automatic Recording Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comments
Search on gun axis using TIS	
Part 3.2. Detection/Location/	Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistencies Comments
ID/Report Ing	Housure Element Automatic Recording Instructor Element Required Represented Hode Feedback Storage Scoring Testable Comments
Detect target(s)/signature(s) obstacle(s) ²	K(K) # #
Locate target(s)	K(K)

 $^{^2}$ There are enough different patterns of cues to look for that detection is more complex than simple observation.

Testing Capabilities of VISS on Gunner Activities

Activity 3. ACRIME TARRET(S) (coet'd)	Received		Artemetic Recording		Comments
destify target(s) mating the					
fellowing determinetions:					
. Branc plan	E(E)			 	
If target detected, assource guings mirgst,					
-TARGET - COCATION		-			-
Coof ire target	E.(0,0)				
Estimate range (approximate to					
order to evaluate LM return)		7			

Part J. (valuate situation

(No gueser actions)

	Some to Section by	Composite Standarful Si		Bertee Jeconstatescies	Comments
Activity 4. CHANGE STREET TANGETS WETE THE MAIN COM	fertial.	I'm and Irection	711		
Option 4.1. Procision engagement - sering (effence)					Does not staulate our tens
	Done to	Composition	Solution large Septition	Bertee	• • • • • • • • • • • • • • • • • • • •
Option 4.2. Procision ongagement - stationary (defense)		The and trecking	<u> </u>		Score may not be construct with termet difficulty
	Received Sequired		Automotic Recording Seds (seedles) Marie		learest stable Compets
Set/check outlines: * First contact most: month. * LNF: Alm LAST 870 * OPS: 3x * Oin SELECT: MIS * AND SELECT as amounced	44.0	<u>Perstel</u> &	timber	<u> </u>	
Sight through DS	CAR		<u> </u>		<u></u>
Group polio autiches	4.0		<u> </u>		<u> </u>
Look through SAS to distorates when gun clears diffileds	6.8.0		<u></u>		<u> </u>
Announce DATHER STOP	<u></u>				b & her or test severed
Last through O'S	5.8.0				electes (45
Amounte 10(01)/1/0	4		<u> </u>		<u> </u>
Series GPS to 101	6.0.0		<u>- — — </u>		<u></u>
Lay on center mass of target	P(0)		<u> </u>		motouse trained being on
Bogin tracking moving targets	0(0)		<u> </u>		7 - Spetter
Depress lose bitter(s)	8(0)		<u> </u>	<u> </u>	T metter
fine hate range display	1.0		•		
Check recepto-fire and fault symbols	4.0				
Nate central ley	0(9)		•		T gentler
Listen for W	4.0				<u> </u>
Listen for FINE	E.0				7
Amounce On THE WAY	<u>(6(6)</u>		Beflection		
Squeeze trigger(s)	<u>N(0)</u>	<u></u>	and (horo- then every <u>1 of round the</u>		Observe altring point on gentler Gunner dust continue tracking after firing for
Continue tracting	<u>P(0)</u>		•		7 a bit

Act felty 4.	CHANG SINGLE TANGETS							
	(cost d)	Deserte	Compe	Na.	Colore ton	Bartes		
	from at						les	Coments
Option 4.3.	Conter cannot							
	Identify assumed							
	target					-		
	A. GM falls to Seest		• • • • • •		• • • • • •		• • • • •	• • • • • • • • • • • • • • • • • • • •
	teres(s)							
		Receive	(leaset	Artem	ttc Recording	g lestructer	(leaset	- Commune
Accessed 64	CAMENT IDENTIFY OF			Andre A	same line	No.	Tenton is	Coments
	respend	4(0)						
								•••••
			Compos					
		Testas le	POSTON (1)	Herest	EMILIA	Techot litters		Compets
Case 4.3.	B. I GMR 14met 1/ tes							
	different terest	_						
		1000	44					
						g lestructor		Compets
					1100	<u> </u>	11111111	Tanana Int. 1
Announces								
-Cilibra	T TARGET -	4(0)					-	
• • • • • •	• • • • • • • • •	Base to			Se lect lee		• • • • •	
							tes	Compets
			1100 000					
Option 4.4.	Date TIS		track lea	-	Tes			
			£1-mas			a Jastructor	-	
								Compets
Set/check m		E.S. 0	Pers tel	.				
	NOL HODE: HOWAL							
* (DF) ARR	ORI EIG							
. ON MILE	To MAID							
. WAS RITH	os amounted							
THE WALL	THE CANAL PROPERTY.							
	L/SITE: SITE NGWT/TCATTON:							
32 to 104								
	MICH WITE							
	IOT, as destred							
	TY, COUTBAST, and best trage							
10000 100								Quality of view depends on
Sight throu	p 95	4.0.0		-				specific videodisc
		Dame to	Compa	Ite	Se lect tee	Boylee		
						Inconsistent	les	Coments
	poglag targets aslag		•				-177	
procision p			The and					
(Opt ton 4.1	pr 4.2)		track les					

	Done in Testable	Composi Meaningful		Depends on	Device Inconsistenc	ies	Comments
Activity S. ADJUST FIRE	Part la l	Time and tracking	No	outcome of first round			
	Hoesure Required	Element Represented		tic Recording medback Storag	A CONTRACTOR OF THE PARTY OF TH		Comments
Recever sight picture	K.8	Bo	<u></u>				
Observe/announce strike of every round	<u>K</u>	Degraded	<u>*</u> _			<u> </u>	
••••••	Dome in Testable	Composi Meaningful		Se lect ion Repet it ion	Device Inconsistenc	les	Comments
Option 5.1. Reengage	<u> </u>						
	Heasure Required	Element Represented		tic Recording edback Storag			Comments
Announce REEMGAGING	K.8	<u> </u>	<u> </u>			<u> </u>	
Release/reengage palm switches	K.8					<u> </u>	Observe aiming point on
Lay center of mass	8(0)	<u> </u>			0	Υ -	monitor
Begin tracking moving target	8(0)		<u> </u>		0	<u> Y</u>	
Depress lase button(s)	8(0)	<u> </u>	<u>H</u>		0	Υ	Observe aiming point on monitor
Evaluate rauge	K,0	<u> </u>					
Check ready-to-fire and fault symbols	K.0		<u>.</u>				
Listen for UP	K.0	<u> </u>	<u> </u>		0	<u> </u>	
Announce ON THE MAY	<u>K.8</u>	<u> </u>	De	flection	-	<u> </u>	-
Squeeze trigger(s)	●(0)	<u> </u>	11	on error rounds		<u> </u>	Observe aiming point on monitor Gunner must continue
Continue tracking	B(0)	<u> </u>				<u> </u>	tracking after firing for a hit

Activity 5. ADJUST FIRE (con't) Option 5.2. Standard adjustment (degraded mode)	Dome in Testable	Compos Meaningful		Selection Repetition	Device Inconsistencies	Ther	Comments e are no degrade mode cises
Option 5.3. TC adjustment	Domain Testable			Selection Repetition	Device Inconsistencies	Ther mil	Comments e is no TC. There is no scale on the monitor so ructor cannot act as TC
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX	Y	Element	Storage	tic Recordin	Device Inconsistencies g Instructor Ege Scoring Te	lement	
Check/positions switches: FIRE CONTROL MODE: NORMAL LRF: ARM LST RTN GPS: 3X GUN SELECT: COAX	<u>K,B,O</u>	Pertial	<u>D1</u>	splay		<u>ert1e1</u>	
Grasp palm switches	K,8,0	<u> </u>	<u> </u>			Υ	
Announce IDENTIFIED	<u>K,B</u>	<u> </u>	<u> </u>			Υ	
Switch GPS to 10X	K,8,0	-				N	Observe aiming point on
Lay center of mass	B(0)	<u> </u>				Y	Monitor Observe aiming point on
Depress lase button(s)	8(0)	<u> </u>	<u>H</u>			Υ	
Evaluate range display	. K,O	<u> </u>	<u> </u>			N .	
Listen for FIRE	K,0	<u> </u>				Y	
Announce ON THE WAY	K,8	<u> </u>	<u>H</u>			Y	
Fire 20-30 round burst (5-6 tracers) to destroy/ suppress point/area targets ³	B(0)	Point targets only	an t1	flection d eleva- on error rounds		Υ	Observe movment of aiming point
Adjust fire ¹	8(0)	<u> </u>				Y	

 $^{^{3}\}mathrm{Outcome}$ is tracers in target area.

Testing Capabilities of VIGS on Gunner Activities

	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistencies	Comments
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN	<u> </u>	Time and Tracking	_No_	Yes		Own tank stationary. Instructor must complete TC command
Engage first target using precision gunnery (Option 4.1 or 4.2)	<u> </u>					Option 4.2 only
If first target is not destroyed, adjust fire as described in Activity 5	<u> </u>					
Engage second target using precision gunnery (Option 4.1 or 4.2)	<u> </u>	<u> </u>				Option 4.2 only; Instructor can give TC command to shift fire

Activity 8. ENGAGE TARGETS WITH THE CAL .50	Domain Testable	Compos Heaningful		Selection Repetition	Device Inconsistencies	Comments
(INCLUDING SIMUL- TAMEOUS MAIN GUN ENGAGEMENTS)	<u> </u>	•				There is no TC station

Activity 9.	ENGAGE TARGETS USING DEGRADED GUNNERY	Domain Testable	Compos <u>Heaningful</u>		Selection Repetition	Device Inconsistencies	Comments Battlesight is only technique
	TECHNIQUES						presented
Option 9.1.	Engage targets using battlesight gunnery	Heasure	Element	Autome	tic Recordin	g Instructor El	
		Required	Represented				table Comments
' LRF: SAF ' GPS: 3X ' GUN SELEC	ROL MODE: NORMAL E	<u>X,B,O</u>	Pertial			(0)	<u> </u>
		Doma in	Compos		Selection		
	et using precision tion 4.1 or 4.2)	<u>Testable</u>	Heaningful	Storage	Repetition	Inconsistencies	Comments
but without	lasing to target	<u> </u>					Option 4.2 only
• • • • •	• • • • • • • • • • • • • • • • • • • •	• • • • •	• • • • • • • • • • • • • • • • • • •		• • • • •		
		Domain Testable	Composi Meaningful		Selection Repetition	Device Inconsistencies	Comments
Option 9.2.	Engage target given ineffective LRF						Not presented
• • • • • •		• • • • •			• • • • • •	• • • • • • • •	• • • • • • • • • • • • • • • • • • • •
		Domain Testable	Compos Heaningful		Selection Repetition	Device Inconsistencies	Comments
Option 9.3.	Engage target given multiple returns from					5	100
	LRF						Not presented
				- 1		STORES IN	
		Domain Testable	Composi Meaningful		Selection Repetition	Device Inconsistencies	Connents
Option 9.4.	Engage target given no						3.05/1110-000
	range display (loss of symbology)						Not presented
		• • • • •			•••••		••••••
		Dome 1.1	Composi	Element see	Se lect ion		4 22142
•	Engage target given		mean ingru l	<u>storage</u>	Repet It 10h	<u>Inconsistencies</u>	Comments
	crossrind failure			 .			Not presented
		Dome 1n	Composi	ite	Se lect ion	Device	
THE CHARLES	Zerra volume enno		•				Coments
	Engage target given cant sensor failure						Not presented

Activity 9.	EMCAGE TANGETS USING DEGRADED GUINERY TECHNIQUES (cont'd)						Comments
Opt 1on 9.7.	Load angle sensor						
	failure						Not presented
		• • • • •			• • • • • • •		• • • • • • • • • • • • • • • • • • • •
Ontion 9.8	GPS failure		Compos Meaningful				Comments
	(day channel)						Hot presented
	(may comman)						Not presented
		Dome to	Compos	ite	Selection	Device	
						•	Comments

	Engage target given GPS/TIS failure						Not presented
							
		Dome in	Compos	ite	Se lect ion	Dev Ice	
							Comments
Opt ion 9.10.	Engage target using	- P.W					
A COUNTY OF	CAS						Not presented
		• • • • •		 .			
		Dome to	Compos	100	Salastian	Routes	
							Connents
Option 9.11.	Engage target given stabilization system failure (emergency	TESTON IN	100000000	3101030	Table 14 ton		- Comments
	mode)						Not presented
	,						
		Dome to	Compas	Ite	Se lect los	Day Ice	
							Comments
				7.5.0			
Option 9.12.	Engage target given turret power failure						
	(mama mode)	- 6					Not presented

Testing this activity is not rated for the gunner.

Activity 10. ENGAGE TARGET FROM TC POSITION

The second secon

	Dome in	Compos	ite	Se lection	Device		
	Testable	Meaningful	Storage	Repet It Ion	Inconsistenc	les	Coments
Activity 11. ASSESS MESILTS OF EMGAGNETT		<u> </u>					
	Measure Required	Element Represented		itic Recordin		Element Testable	Comments
Check/adjust MRS	K.8.0	No					
Index bettlecarry arms	K.8.0	No					
Announce <appo> 110EXED</appo>	K.0	No				1307.12	

APPENDIX I - 3 TESTING CAPABILITIES OF TOPGUN ON GUNNER ACTIVITIES

Activity 1. PREPARE STATIONS FOR OPERATION	Dome in Testable	Compost <u>Mean ingful</u>		Se lect ion Repet 1t ion	Device Inconsistenc	1es	Comments
	Heasure Required	Element Represented		tic Recording		Element Testable	Comments
Enter guaner station	K.8.0					<u> </u>	
Operate domelight	K,B,0				- —		
Operate Intercom	K,8,0				. —		
Install coax	K.B.0						
Adjust seets	K,8,0					<u> </u>	
Adjust broupads	K.8.0		——			 -	
Adjust chestrest	K,B,0						·
Four up station	K.B.0				. —	<u> </u>	
Perform GPS function check	K.8.0			12. 22.	. —		
Adjust GPS	K,8,0					<u> </u>	
Perform computer self-test	K.B.0				. ——	<u> </u>	
Perform computer data check	K.S.0						
Perform TIS check	K.8.0					<u> </u>	
Perform GAS adjust	K.B.0					<u> </u>	
Check power control handles	K,8,0	<u> </u>					
Check manual elevation/traverse cranks	K.8.0						·····
Perform load system check	K.B.O					<u> </u>	·
Perform firing circuits check	K.B.O					<u> </u>	
Perform crosswind sensor check	K.B.0						
Perform hydraulic pressure check	E.B.0				. —	<u> </u>	

Activity 2. PERFORM PREPARE- TO-FIRE CHECKS	Domain Testable	Composite Selection Device Meaningful Storage Repetition Inconsistencies Comments
	Heasure Required	Element Automatic Recording Instructor Element Represented Hode Feedback Storage Scoring Testable Comments
Boresight main gun	KS. (0)	_ <u></u>
Zero coex	K&B, (0)	
Report weapon status ¹	K.0	N No one to report to
Index battlecarry ammo on AMMO SEL switch	K 9.0	
Introduce battlecarry range into CCP	K.0.0	
Option 2.1. Preserve for offense	Done in Testable	Composite Selection Device Meaningful Storage Repetition Inconsistencies Comments H
	Measure Required	Element Automatic Recording Enstructor Element Represented Mode Feedback Storage Scoring Testable Comments
Receive TC briefing		
•••••	Dome 1m	Composite Selection Device Hearingful Storage Repetition Inconsistencies Comments
Option 2.2. Propare for defense		
	Measure Required	Element Automatic Recording Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Inspect terrain through GPS/TIS	K(K)	
Check GAS clearence	K,8,0	_
Learn TRPs	<u> </u>	

 $^{^{1}}$ Outcome is TC knowing correct information.

	Domain Testable	Composite Selection Device Meaningful Storage Repetition Inconsistencies Comments
Activity 3. ACQUIRE TARGET(S)		Consider to CVT and related
Port 3.1 Search		Scenario on CKT, not viewed through eyepiece. Reduced lest validity expected.
Option 3.1.1. Open hatch - day		Open hetch not simulated
•••••	Domain Testable	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
Option 3.1.2. Closed hatch - day	<u>(Y)</u>	See comment Part 3.1 above
	Measure Required	Element Automatic Recording Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Select 3X GPS/TIS magnification	K,8,0	
Search on gun axis using GPS	K,8,0	
Alternate using GPS with TIS	K.(8.0)	(Y) 0 B (Y)
Execute search techniques to acquire targets	<u>_ĸ</u>	(Y) No observable behavior
•••••	Domein Testable	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
Option 3.1.2. Hight		See comment Part 3.1 above
	Heasure Required	Element Automatic Recording Instructor Element Represented Hode Feedback Storage Scoring Testable Comments
Search on gun axis using TIS	<u> </u>	(Y) N No observable behavior
Pert 3.2. Detection/Location/	Dome in Testable	Composite Selection Device Meaningful Storage Repetition Inconsistencies Comments
and trades of the	Measure	Element Automatic Recording Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Detect target(s)/signature(s) obstacle(s) ²	<u>K(K)</u>	Degraded
Locate target(s)	K(K)	<u> </u>

²There are enough different patterns of cues to look for that detection is more complex than simple observation.

Testing Capabilities of TOPGUN on Gunner Activities

Activity 3. ACQUIRE TARGET(S) (cont'd)	Measure Required	Element Represented	Automatic Recording Mode Feedback Storage	 	Coments
Identify target(s) making the					
following determinations:					
· IFFN					
* Nomenclature	K(K)		<u>*</u>	 <u> </u>	
If target detected, announce					
GUNNER REPORT,					
<target> <location></location></target>	K,B			 	
Confirm target	K,(B,0)		<u> </u>	 <u> </u>	
Estimate range (approximate in					
order to evaluate LRF return)	K	Degraded	<u> </u>	 <u> </u>	

[No gunner actions]

	Domain Testable	Compos <u>Meaningful</u>		Selection Repetition Informal	Device Inconsistenc	les	Comments
Activity 4. ENGAGE SINGLE TANGETS WITH THE MAIN GUN	Part (a)	Points for Hits	TI.	Training Hode		Stat	ionary tank only
Option 4.1. Precision engagement – moving (offense)							tank moving is not esented
Option 4.2. Precision engagement - stationery (defense)	<u> </u>	Points for Hits	_ <u>_</u>	Informal Training Mode			••••••
	Measure Required	Element Represented		tic Recording		Element Testable	
Set/check switches: FIRE CONTROL MODE: MORMAL LRF: ARM LAST RTN GPS: 3X GUM SELECT: MAIN AMMO SELECT as announced	K,8, 0	Pertial		aht		110	Same to appropriate on
Sight through GPS	K,B,0	<u>(Y)</u>		Use L			Score 1s presented on large CRT
Grasp palm switches	K,B,0	Y				<u> Y</u>	
Look through GAS to determine when gun clears defilade	K,8,0			· ·	- —		
Announce DRIVER STOP	K,B						
Look through GPS	K,2.0						
Announce IDENTIFIED	K,B					<u> </u>	
Switch GPS to 10X	K,8,0	Υ	0 1n	ght Use L acking		<u> </u>	
Lay on center mess of target ³	8,(0)	<u> </u>	0 Er	ror L	_ 0_	<u> </u>	Observe CRT
Begin tracking moving targets ³	8,(0)	Υ		acking ror L	0	Y	Observe CRT
Depress lase button(s)4	8, (0)	Y	0 8	ange L	0	<u> </u>	Observe CRT at ranging
Evaluate range display ⁵	K,0	Degraded					
Check ready-to-fire and fault symbols	K,0	<u> </u>				<u> </u>	
Make control lay ³	8,(0)	Y	O Er	acking ror L	0	Y	Observe CRT
Listen for UP7	K,0	Y		- 112		<u> </u>	
Listen for FIRE ⁴	K,0	(Y)					FIRE may be announced before gunner says IDENTIFIED
Announce ON THE WAY	K,8	Υ				<u> </u>	

³For this element and similar elements throughout the entire domain, the relevant outcome is the sight picture.

⁴For element and similar elements throughout the entire domain, the relevant outcome is the sight picture at the time of lasing/firing.

⁵For this element and similar elements throughtout the domain, the relevant outcome is implementing activities 9.2 or 9.3 or relaxing.

⁶For this and similar elements throughout the entire domain, the outcome is firing only if the ready-to-fire signal is visible.

⁷For this element and similar elements throughout the entire domain, the relevant outcome is firing only after UP and FIRE are announced.

Activity 4. ENGAGE SINGLE TARGETS		
WITH THE MAIN OUR	Measure	Element Automatic Recording Instructor Element
(cont'd)	Regulred	Represented Hode Feedback Storage Scoring Testable Comments
(000 0)	MI GILL	1 le
		Miss
Courses Andresofe's	0 (0)	
Squeeze trigger(1)	- 1(0)	Y 0.7 Distance L O Y Observe CRT
		Tracking
Continue tracking	8.(0)	Y O Error L O Y Observe CRT
• • • • • • • • • • • • • • • • • • • •		• • • • • • • • • • • • • • • • • • • •
	Done in	Composite Selection Device
	Testable	Meaningful Storage Repetition Inconsistencies Comments
Option 4.3. Gunner cannot identify		
		to TO to contain
announced target		Mo TC to easist
		• • • • • • • • • • • • • • • • • • • •
Case 4.3.A.: GMR falls to Identify	1	
target(s)		
	Managemen	
	Measure	Element Automatic Recording Instructor Element
	Required	Represented Mode Feedback Storage Scoring Testable Comments
Announces CANNOT IDENTIFY or		
does not respond	K(B)	
	Dome 1m	Composite Selection Device
		Heaningful Storage Repetition Inconsistencies Comments
Case 4.3.8.: GMR Identifies	10000	THE RESERVE THE PARTY OF THE PA
different target		
	Measure	Element Automatic Recording Instructor Element
		Represented Mode Feedback Storage Scoring Testable Comments
Assessed INCHTICK	MANG II AA	represented room resource storage storage testable tomatts
Announces IDENTIFY		
*OIFFERENT TARGET>	K(B)	<u>Ho 7C</u>
		• • • • • • • • • • • • • • • • • • • •
	Doma in	Composite Selection Device
	Testable	Heaningful Storage Repetition Inconsistencies Comments
		Points for
Option 4.4. Use TIS	٧	Hits
	Measure	Element Automatic Recording Instructor Element
	Regulred	Represented Mode Feedback Storage Scoring Testable Comments
	- 1 - 1 - 1 - 1 - 1 - 1	
Set/check switches:	K,B, O	Pertiel
* FIRE CONTROL MODE: NORMAL		The disk of the same and the sa
LRF: ARH LAST RTN		
' GPS: 3X		
' GUN SELECT: MAIN		
* APPO SELECT as announced		
THERMAL MODE: ON		
* FLTR/CLEAR/SHTR: SHTR		
THERMAL MAGNIFICATION: 3X TO 10X		
POLARITY SWITCH: WHITE		
or BLACK HOT, as desired		
' SENSITIVITY, CONTRAST, and		
FOCUS for best image		
		Sight
Clabs through CDC		(iii) (iii)
Sight through GPS	K,8,0	N 0 1n Use L N
	10-	
	Doma 1n	Composite Selection Device
	Testable	Heaningful Storage Repetition Inconsistencies Comments
Continue engaging targets using		Chemica De la Privationia (etc. 111 de la 111
precision gunnery		Points for
(Option 4.1 or 4.2)	Y	Hits L

Testing Capabilities of TOPGUN on Gunner Activities

	Demote Testable			10, Depend-	Berice Incomintent	<u> </u>	Commette
Activity 5. ABJUST FINE	Pers tel	Polots for	4	on lot Rd. Miss			
	Resure Required	(leaest Represented			lastructor	-	Compets
Recover sight picture	<u> </u>	Degraded					
Observe/announce strike of avery round	٠	Degrated					
	Done in Testable	Compos Maca (ngfu)		Selection Repetition	Device Incensistenc	101	Comments
Option 5.1. Reengage					-		
	Required	Element Represented			Instructor on <u>Scoring</u>		Coments
Announce REENGAGING	ш_	(Y)					
Release/reengage palm switches	<u> </u>						
Lay on center mass of target	8.(0)			reck line		<u> </u>	Observe CRT
Begin tracking moving targets	8.(0)			ror L		<u> </u>	Observe CRT
Depress lase button(s)	0,(0)		0 1	lange L		<u> </u>	Observe CRT at ranging
Evaluate range display	<u> </u>	Degraded					
Check ready-to-fire and fault symbols	K,0		— <u>F</u>	rack lass			
Listen for UP	K,0						
Announce ON THE WAY	_K.8	Y					
Squeeze trigger(s) ⁸	8,(0)	<u> </u>	0,T 0	stance L		<u> </u>	Observe CRT
Continue tracking	8,(0)		0 E	100000000000000000000000000000000000000			Observe CRT
	Dome in Testable	Compos <u>Mean ingful</u>		Selection Repetition	Device Inconsistenci	les	Comments
Option 5.2. Standard adjustment (degraded mode)						No de	greded mode
	Dome in Testable	Compos	ite	Se lect les	Dev Ice		Comments
Option 5.3. TC adjustment				 -		No TC	

^{*}TOPGUN softwere looks for BOT solution if first round in a dispersion round created by the softwere *probability factor.*
Being contrary to doctrine, this will reduce test validity.

Testing Capabilities of 107000 on Gunner Activities

Activity 6. EMANE A SIMILE TABLET WITH THE COAR	Bonn to Testable	Composite Passingful Storess	Se lect lee Beset It les	Berrico Jecons intencion	Comments To cook attraction
Activity 7. ENGAGE MATTIPLE TANGETS WITH THE MAIN GIR	Done in Testab ie	Composite Heatingful Storage Points for Hits L	Selection Repotition Informal Training Mode	Boy ice Inconstituent les	Comments
Engage first target using precision gunnery (Option 4.1 or 4.2)		Points for			
If first carget is not destroyed, adjust fire as described in Activity 5					
Engage succent target using practision gunnery (Option 4.1 or 4.2)		Points for Hits			
***************************************	Dome in Testable	Composite Page Ingle Storage	Se lect len	Device Jacons intencios	Comments
Activity 8. EMBASE TANGETS VITH THE CAL .50 (INCLUDING SING.— TANEOUS MAIN GUN					TC station not simulated

Testing Capabilities of TOPGUN on Gunner Activities

Activity 9. ENGAGE TARGETS USING	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistent	iles .	Comments
DEGRADED GUIMERY TECHNIQUES						GAS (nly technique presented
Options 9.1 to 9.9, 9.11 and 9.12							
Option 9.10. Engage target using GAS	<u>(Y)</u>	Points for Hits		Informel Training Mode		_	
	Heasure Required	Element Represented		stic Recording sedback Storag		Element Testable	Connents
Set/check switches: 'FIRE CONTROL MODE: NORMAL 'LRF: SAFE 'GUN SELECT: MAIN 'APPO SELECT: as announced	K,8,0	<u>Pertial</u>					
Sight through GAS	K,8,0	(Y)	0 1 ₁	ight n Use <u>L</u>			
Grasp palm switches	K,8,0	Υ				<u> </u>	
Announce IDENTIFIED	K,B					<u> Y</u>	
Lay announced range line on target	\$(0)	<u>(Y)</u>	0 <u>E</u>	racking rror L		_(Y)	Range is not announced, but appear on CRT data area. Use of range line can be observed on CRT. Range is not announced, but appear on CRT data
. 2.5 mils for sapet . 5 mils for HEAT	K&B(0)	<u> </u>		recking rror L		<u> </u>	area. Use of range line can be observed on CRT. FIRE may be announced
Listen for FIRE	K.0	<u> </u>				<u> </u>	before gunner says IDENTIFIED
Announce ON THE MAY	<u>K.B</u>	<u> </u>		lss		<u> </u>	
Squeeze trigger(s) ¹⁰	0(0)	Y	0 0	istance L	- —	<u> </u>	Observe CRT
Continue tracking	8(0)	<u> </u>		ror L		<u> </u>	Observe CRT
Activity 10. EMBAGE TABGET FROM TC POSITION Testing this activity 1	s mot rate	d for the gu	ner.	•••••••	•••••••	•••••	••••••••••
						•••••	•••••
	Dome in Testable	Composi Meaningful		Selection Repetition	Device Inconsistenc	103	Comments
Activity 11. ASSESS RESULTS OF ENGAGEMENT					· · · · · · · · · · · · · · · · · · ·		

Outcome is corrected sight picture.

 $^{^{10}}$ Outcome is corrected sight picture at time of firing.

APPENDIX I - 4 TESTING CAPABLITIES OF UCOFT ON GUNNER ACTIVITIES

Assistant Because STATIONS	Domain Testable	Compos ⁴ Meaningful		Selection Repetition	Device Inconsistenc	les	Comments
Activity 1. PREPARE STATIONS FOR OPERATION	<u> </u>	<u></u>	<u></u>	<u></u>	<u></u>	Many	wissing elements
	Heasure Required	Element Represented		tic Recording		Element Testable	Comments
Enter gunner station	K,8,0						
Operate domelight	K,8,0	Y	<u> </u>		8,0	<u> </u>	
Operate intercom	K,B,0					<u> </u>	
Install coax	K,8,0						
Adjust seats	K,8,0	<u> </u>	<u>N</u>			<u> </u>	
Adjust browpeds	K,8,0	<u> </u>	<u>H</u>			<u> </u>	
Adjust chestrest	K,8,0	<u>Y</u>	<u> </u>			<u> </u>	
Power up station	K,8,0					<u> </u>	
Perform GPS function check	K,8,0						
Adjust GPS	K,8,0				- —	<u> </u>	
Perform computer self-test	K,8,0	<u> </u>	<u> </u>		-		
Perform computer data check	K,8,0						
Perform TIS check	K,B,0	<u> </u>	<u> </u>		- —		
Perform GAS adjust	K,B,0	<u> </u>					
Check power control handles	K,8,0	<u> </u>				<u> </u>	
Check manual elevation/traverse cranks	K,B,0	<u> </u>	<u>*</u>			<u> </u>	
Perform lead system check	K,8,0	<u> </u>	<u>*</u>			<u> </u>	
Perform firing circuits check	K,B,0	N				<u> </u>	
Perform crosswind sensor check	K,8,0						
Perform hydraulic pressure check	K,B,0	N					

Activity 2. PERFORM PREPARE-	Oome in Testable	Compos Meaningful	Storage Repet		Device onsistenci		Comments nsistent and missing
TO-FIRE CHECKS						<u>e len</u>	ents
	Heasure Required	Element Represented	Automatic Rec Mode Feedback				Comments
Boresight main gun	K&B, (0)					<u>#</u>	
Zero coex	KAS, (0)						
Report weapon status ¹	K,8	<u> </u>	<u> </u>		<u> </u>	y	
Index battlecarry ammo on AMMO SEL switch	K,8,0	<u> </u>	<u>N</u>	 -	8,0	Υ	
Introduce battlecarry range into CCP	K.B.O	<u> </u>	<u> </u>		8.0	Y	
Option 2.1. Prepare for effense	Domain Testable	Composi Heaningful	ite Select Storage Repeti		Device onsistenci	<u>u</u>	Comments
	Heasure Required	Element Represented	Automatic Rec Mode Feedback				Comments TC briefing is not
Receive TC briefing	K	Degraded	*			<u> </u>	required by U-COFT
Option 2.2. Prepare for defense	Dome In	Composi <u>Heaningful</u>	te Select Storage Repeti		Device Insistencia	<u></u>	Comments
option 2.2. Prepare for Gerense	Heasure Required	Element Represented	Automatic Rec Mode Feedback	-			Comments
Inspect terrain through GPS/TIS	<u>K(K)</u>	Degraded	1			<u> </u>	No observable behavior
Check GAS clearance	K,8,0	<u> </u>	<u> </u>		<u>.</u> .	Y	
Learn TRPs	<u>K</u>					in i	Sketch/TRPs not drawn

 $^{^{1}\}mathrm{Outcome}$ is TC hearing correct information.

	Dome in Testable	Compos Heaningful		Selection Repetition	Device Inconsisten		Comments litions are too degraded
Activity 3. ACQUIRE TARGET(S)							adequate/velld testing
Part 3.1 Search	_ H					UCOF	T does not simulate
Option 3.1.1. Open hatch - day							-hetch
Option 3.1.2. Closed hatch - day	(Y)	Compos Heaningful	ite <u>Storage</u>	Selection Repetition	Device Inconsistent	<u>:1es</u>	
	Required	Element Represented		tic Recordin	•		Coments
Select 3X GPS/TIS magnification	K,8,0	Υ	II.		8,0	<u> </u>	
Search on gun axis using GPS	K,8,0	Υ				7	Stimuli simplified
Alternate using GPS with TIS	K.(8.0)	٧				Y	Cues do not change; may penalize a UCOFT experienced gunner who no longer switches
Execute search techniques to			77				Alberta William Co.
acquire targets	_ <u>K</u>	<u> </u>					Cannot observe searching
Option 3.1.2. Hight	Dona in Testable	Compos Meaningful		Selection Repetition	Device Inconsistent	:1es	Comments
Search on our exis using TIS	Heasure Required	Element Represented Degraded	<u>Hode</u> Fe	tic Recordin			Comments
• • • • • • • • • • • • • • • • • • • •						•••••	
Part 3.2. Detection/Location/	Domain Testable	Compos Heaningful	1177	Selection Repetition	Inconsistent	les	Connents
ID/Report ing							lation may reduce validity
Detect target(s)/signature(s) obstacle(s) ²	Required K(K)	Element Represented Degraded	<u>Mode</u> Fe	tic Recording	oe <u>Scoring</u>	<u>Testable</u>	Comments No observable behavior er outcome
Locate target(s)	K(K)	Degraded					No observable behavior or outcome
Identify terget(s) making the following determinations:	aaa	W) TOUT					No observable behavior
* Nomenclature	K(K)	Degraded					or outcome
If target detected, announce GUNNER REPORT, <target> <location:< td=""><td><u>K.B</u></td><td><u> </u></td><td><u>*</u> _</td><td></td><td></td><td></td><td>No observable behavior or outcome</td></location:<></target>	<u>K.B</u>	<u> </u>	<u>*</u> _				No observable behavior or outcome
Confirm target	K, (B, 0)	ΥΥ	<u> </u>				No observable behavior or outcome
Estimate range (approximate in order to evaluate LRF return)	<u>K</u>	<u>Degraded</u>					

²There are enough different patterns of cues to look for that detection is more complex than simple observation.

Testing Capabilities of UCOFT on Sunner Activities

Domain Composite Selection Device
Testable Meaningful Storage Repetition Inconsistencies Comments

Activity 3. ACQUIRE TARRET(S)
(cont'd)

Port J. Evaluate situation

(No gunner actions)

	Done in Testable	Compos Maningfyl		Se lect lee Repet It lee	Device <u>Jacons leton</u>	:ps	Comments
Activity 4. EMEAGE SINGLE TARGETS WETH THE MAIN CON		Complex ³		Linited			
Option 4.1. Procision engagement - moving (offense)	Y Measure Beguired	Complex Element Represented		Limited at ic Recording archeck Stores			Comments Be penalty for setting
Set/check sufficients: 'FIRE CONTROL MODE: MONNL 'LRF: ANN LAST RTN 'GPS: 3X 'GUN SELECT: MAIN 'AND SELECT as announced	K.B.(0)		_ _				Sun Select or LRF early Switch settings can be observed at console
Sight through GPS	K.B.0						
Grasp palm switches	K.B.0	<u> </u>					
Announce 10ENT1F1ED	K.8		1_		_		fed to by instructor
Switch GPS to JOX	K.B.0	<u> </u>			8.0		
Lay on conter mass of target ⁴	0.(0)		0_1	leplay 5	_		Correctness of sight picture judged at console Correctness of sight
Bogie tracking moving targets ⁴	8.(0)		0 1	eplay 5	_		picture judged at console
Listes for driver alerts							
Depress lase button(s) ⁵	8.(0)		• •	lep lay 5			Correctness of range return judged at coase le Conservable bakevier enly
Evaluate range display	K.0	Degraded	1_		0.0	_(1)_	If range judged incorrect
Check ready-to-fire and fault symbols	<u> K,0</u>				9.0	_m_	Observable behavior only if fault symbol present Correctness of sight
Make control lay	8.(0)						picture judged at coase le
Listen for UP?	K,0						
Listes for FIRE ⁶	K.0		4				
Announce ON THE WAY	K.8	<u> </u>	1				
Squeeze trigger(s) ⁵	9. (0)		0_1	eplay S			Correctness of sight picture judged at console, Az and E1 reticle error at console is contaminated by renging, switch settings and round to round dispersion
	- 116						Correctness of sight
Continue tracking	0,(0)	<u> </u>	0 8	eplay 5	0	<u> </u>	picture judged at coaso le

 $^{^{3}}$ See Chapter 6 for a description of UCOFT scoring.

For this element and similar elements throughout the entire domain, the relevant outcome is the sight picture.

 $[\]frac{s}{r}$ or element and similar elements throughout the entire domain, the relevant outcome is the sight picture at the time of losing/firing.

For this and stailer elements throughout the entire domain, the outcome is firing only if the ready-te-fire signal is visible.

⁷For this element and similar elements throughout the entire domain, the relevant outcome is firing only after UP and FIRE are announced.

Announce ON THE MAY

Squeeze trigger(s)

Continue tracking

Activity 4. EMBAGE SIMBLE TARGETS WITH THE MAIN COR (cont'd) Done to Competite Se lect lea Dev Ice Testable Measingful Storage Reportition Inconsistencies Consents Outles 4.2. Procision engo - stationary (defense) Y Complex L Linited Element . Automotic Recording Instructor Element Hoosure Reculred Represented Note feedback Storess Scoring Testable Comment s No penalty for setting Set/check switches: Sen Select or LRF early 9.0 FIRE CONTROL MODE: Switch settings can be observed at coase le HORMAL " LOF: MON LAST RTW * CPS: 3X " GUM SELECT: MAIN " NOO SELECT as announced Sight through GPS K.B.O Grosp pale pritches K.8.0 Y Look through GAS to determine Difficult to tell if GOR uben gun cloors defilade actually looking Can time assessment Announce MIVER STOP rether then look _1 Look through 675 K.8.0 Announce IDENTIFIED fed to by instructor Switch GPS to 10X K.0.0 Correctness of sight 8,(0) Y 0 Replay picture judged at conso le Lay on center mass of target Correctness of sight eleture judged at conso le Begin tracking moving targets 8, (0) Y O Replay 5 Correctness of reage 8.(0) return Judged at console Depress lase button(s) Y 0 Replay 5 0 Cheervable behavior only If range tudged incorrect Evaluate range display 8.0 (Y) K.O Degraded H Check ready-to-fire and fault Cherroble behavior only K.0 <u>(Y)</u> syste is 8,0 If fault symbol present Correctness of sight ____Y 8, (0) Y 0 Make control lay picture judged at conso le Listes for W K.0 Y 4 _K.0___ Listes for FIRE

0 Replay

0,(0)

Y

___Y

Y

0

B.(0) Y O Replay S O Y picture judged at console

Correctness of sight

Correctness of sight

picture judged at console

Activity 4. EMPAGE SIMPLE TARGETS WITH THE MAIN GUM (cont'd) Option 4.3. Gumer cannot	Heasure		Automatic Recording Hode Feedback Storag		Testable	Coments Prence determined by GMR
Identify announced target			<u></u>		CHR	must make one of three
Case 4.3.A.: GMR fails to ident target(s)						
Announces CAMOT 10ENT1FY or	Heasure Required		Automatic Recording Mode Feedback Storag			Comments
does not respond	K(S)	• • • • • • •		• • • • • •	<u> </u>	
		Composi Maan Ingfu 1	Storage Repetition	Device Inconsistenc	les	Comments
Case 4.3.8.: GRR 1dent1f les different target	<u>(Y)</u>					
	Required		Automatic Recording Mode Feedback Storag			Coments
Announces IDENTIFY -OIFFERENT TANGET>	<u>K(8)</u>	<u> </u>			<u> </u>	May require error by TC to evoke this response
			te Selection Storage Repetition		les	Comments sufficiently degraded to
Option 4.4. See TIS	<u> </u>				quest	tion adequacy for testing
	Resure Required		Automatic Recording Hode Feedback Storage			Comments
Set/check switches: FIRE CONTROL MODE: MORMAL LRF: ARM LAST RTH GPS: 3X GWN SELECT: MAIN ANNO SELECT as ennounced THENNAL MODE: ON FLITE/CLEAR/SHITE: SHITE THENNAL MORIFICATION: 3X to 10X POLARITY SMITCH: MMITE or BLACK MOT, as desired SENSITIVITY, CONTRAST, and FOCUS for best image Sight through GPS	K,8,0	V low Degraded			<u> </u>	
Continue engaging targets using	Dome in Testable	Composition (Meaningful	te Selection itorage Repetition	Device [aconsistenti	<u>••</u>	Comments
precision gunnery (Option 4.1 or 4.2)						sufficiently degraded to tion adequacy for testing

	Domain Testable	Compos Meaningful		Select Repet 1		Device nconsistenc	ies	Comments
Activity 5. ADJUST FIRE	Degraded							
	Heasure Required	Element Represented			-	Instructor Scoring		Comments
Recover sight picture	K,8	Degraded						
Observe/announce strike of every round	<u>K</u>	Degraded						
••••••	Dome in Testable	Compos Meaningful		Select Repetii		Device nconsistenc		Comments rrence depends on missing
Option 5.1. Reengage	<u> </u>					··········	firs	t round
	Heesure Required	Element Represented				Instructor Scoring	Element Testable	Comments
Announce REENGAGING	K,8	<u> </u>	<u>*</u>				<u> </u>	
Release/reengage palm switches	K,8	<u>Y</u>	<u> </u>			8	<u> </u>	
Lay on center mass of target	1.(7)		0 1	Replay		0	<u> </u>	Correctness of sight picture judged at consolu
Begin tracking moving targets	8,(0)	<u>Y</u>	0	Rep lay	S	0_	<u> </u>	Correctness of sight picture judged at console
Listen for driver alerts	<u> </u>							
Depress lase button(s)	8,(0)	<u> </u>	0 1	Replay	5	0	<u> </u>	Correctness of range return judged at console
Evaluate range display	K,0	Degraded	<u></u>			8,0	<u>(Y)</u>	Observable behavior only if range judged incorrect
Check ready-to-fire and fault symbols	K,0	<u> </u>	<u>.H.</u>		,	8,0	<u>(Y)</u>	Observable behavior only if fault symbol present
Make control lay	8,(0)		<u> </u>			0	Υ	Correctness of sight picture judged at console
Listen for UP	K,0	<u> </u>	<u></u>			0	<u> Y</u>	
Announce ON THE WAY	K,8	<u> </u>	<u></u>			8	<u> </u>	
Squeeze trigger(s)	8,(0)	<u> </u>	0_1	tep lay	<u>s</u>		<u> </u>	Correctness of sight picture judged at console
Continue tracking	8,(0)	<u> </u>	0_1	lep lay	<u>s</u>		<u> </u>	Correctness of sight picture judged at console

Activity 5. ADJUST FIRE (con't)	Dome in Testable	Compos Meaningful	ite Selection Storage Repetition	Device Inconsistencies	Comments
Option 5.2. Stendard adjustment (degraded mode)	Υ				Occurrence depends on first round miss and degraded mode
	Measure Regulired	Element Represented	Autometic Recording Mode Feedback Store		Instructor must observe deflection and range
Observe/announce deflection and range error	K(B)	Degraded	<u> </u>		judge GNR's response Hay be difficult to
Release/reengage palm switches	K,8	<u> </u>	И	<u> </u>	100
Adjust 1 mil deflect on	X&8(0)	<u> </u>	O Replay S	<u>0 Y</u>	Observed et conso le
Adjust 200 meters range ⁸	KAB(0)	<u> </u>	O Replay 5	_ <u> </u>	Observed at conso le
Begin tracking moving target	8(0)	<u> </u>	O Replay S	<u> </u>	Observed at console
Listen for UP	K,0	<u> </u>	<u> </u>	<u> </u>	
Announce ON THE WAY	<u>K,B</u>	Y	<u> </u>	<u> </u>	
Squeeze trigger(s)	8(0)		0 Replay	<u>8 Y</u>	Observed at console
Continue tracking	8(0)		0 Replay	<u> </u>	Observed at console
Option 5.3. TC adjustment	Doma 1n	Composi		Dev1ce	
	Heasure Required	Element Represented	Automatic Recording Mode Feedback Storage		
Release/reengage palm switches	K,8,0	<u> </u>	<u></u>	<u> </u>	
Apply TC correction ⁸	KLB(0)	<u> </u>	1	<u> </u>	Observed at console
Listen for UP	K,0	<u> </u>		_ <u> </u>	
Announce ON THE WAY	K,B	<u> </u>	<u> </u>	<u> </u>	
Squeeze trigger(s)	8(0)		O Replay	<u> </u>	Observed at console
Continue tracking	8(0)		0 Replay	_ <u> </u>	Observed at console

^{*}Outcome is adjusted sight picture.

Activity 6. ENGAGE A SINGLE	Dome in Testable	Composi Meuningful		Device nconsistencies	Comments
TARGET WITH THE COAX	<u> </u>		L Limited		
	Heasure Required	Element Represented	Automatic Recording Mode Feedback Storage		
Check/positions switches: FIRE CONTROL MODE: NORMAL LRF: ARM LST RTN GPS: 3X GUN SELECT: COAX	K,9,0		<u> </u>	<u> </u>	at console
Grasp palm switches	K,8,0	<u> </u>	<u> </u>	<u> </u>	
Announce IDENTIFIED	K.8	<u> </u>		<u>8</u> Y	-
Switch GPS to 10X	K,8,0	Y	T Disp1-v	<u> </u>	Secretary of state
Lay on center mess of target	8,(0)	<u> </u>	O Replay S	<u> </u>	
Depress lase button(s)	8,(0)	<u> </u>	O Replay S	<u>0 Y</u>	Correctness of range return judged at console
Evaluate range display	K,0	Degraded	<u></u>	8,0 (Y)	Observable behavior only if range judged incorrect
Listen for FIRE	K,0_	<u> </u>	<u></u>	<u>0 Y</u>	
Announce CN THE WAY	K,0	<u> </u>	<u></u>	<u> </u>	
Fire 20-30 round burst (5-6 tracers) to destroy/ suppress point/area targets ⁹	8(0)	Degraded	O Replay S	<u> </u>	Observe at console
Adjust fire ¹²	8(0)	Replace	O Replay S	<u> </u>	Observe at console

⁹Outcome is tracers in target area.

		Domain Testable	Compos		Se lect ion	Device Inconsistenc	las	Comments
Activity 7.	ENGAGE MULTIPLE TARGETS WITH THE	Teacable	A. SOUTHWIST	3001898	Nepet It Ion	THEORY IS CORE	<u> </u>	Comments
	MAIN GUN	<u> </u>	Complex		Limited			
	t target using unnery (Option 4.1						<u>See</u>	4.1/4.2
	rget is not destroyed, as described in						See	5
	nd target using unnery (Option 4.1						See	4.1/4.2
			***********	•••••	************		********	•••••••••••
		Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistenc	ies	Comments
Activity 8.	ENGAGE TARGETS WITH THE CAL .50 (INCLUDING STHAL- TANEOUS MAIN GUM ENGAGEHENTS)							
Option 8.1.	Simultaneous targets	<u> </u>	Comp lex	<u> </u>	Limited			
	gun target using unnery (Option 4.1	<u> </u>					See -	4.1/4.2
standard adj							•	
(Option 5.2)		<u> </u>				•	See !	5.2
		Required	Element Represented			Instructor Scoring	Testable	Comments Judge appropriateness from target hit displayed
Announce TAR	GETCEASE FIRE	K(B)	<u> </u>	<u>"</u> _			<u> </u>	at console
		A4-		**************************************	A.1A4	<u> </u>		••••••••••
		Dome in Testable	Compos Heaningful		Selection Repetition	Device Inconsistence	les	Comments
Option 8.2.	Cal .50 targets	<u> </u>			Limited			
		Heesure Required	Element Represented			Instructor Scoring		
Ald in adjus	ting TC's weapon	K(B)	Υ				Υ	Judge corrections from console

	Dome in	Composite	Selection	Device	
Allow the Control of	Testable	Meaningful Storage	Repet It ion	Inconsistencies	Comments
Activity 9. ENGAGE TARGETS USING REPLACE CUNNERY					Bank (a.) . aawanaa
TECHNIQUES	(Y)				Partial coverage degraded conditions
The state of the s					degrade constraint
Option 9.1. Engage targets using					
battlesight gunnery	<u> </u>	Complex L	Limited		
	Measure	Element Automa	tic Becordin	g Instructor Ele	me nt
		Represented Mode Fo			ableComments
				sv h=	
Set/check switches:	K,8,0	<u>_</u>			No penalty for setting
* FIRE CONTROL MODE: NORMAL * LRF: SAFE					Gun Select early Switch setting can be
· GPS: 3X					judged from console
GUN SELECT: MAIN					
* AMMO SELECT: battlecarry ammo					
	Dome in	Composite	Se lect ion	Device	
	· · · ·	Meaningful Storage			Comments
	10000				
Engage target using precision					
gunnery (Option 4.1 or 4.2)	u				1400.4.4.4
but without lasing to target					See 4.1/4.2
	Dome in	Composite	Se lect ion	Dev1ce	
	Testable	Heaningful Storage	Repetition	Inconsistencies	Comments
Option 9.2. Engage target given	100000000000000000000000000000000000000				
ineffective LRF					
Case 9.2.A. Use battlesight					
gunnery	Υ				See 9.1
P					
Engage target using battlesight gunnery (Option 9.1)					
Case 9.2.8. TC indexes range					
Forms towns water and a					
Engage target using precision gunnery (Option 4.1 or 4.2)					
but without lasing to target	Y		and the second second		
700 -510110.		W-44-67 259-5			
	Heasure			g Instructor Ele	
	Required	Represented Mode Fe	edback Stora	ge Scoring Test	able Comments
Announce IDENTIFIED	K(8)				
					

Press ENTER button K.B.O Y N B Y		ACE GUNNERY NIQUES	Domain Testable	Compos <u>Heaningful</u>		Selection Repetition	Device Inconsistence	<u>105</u>	Comments
Open CCP door K,P,O Y R B Y Fress RANGE button K,3,0 Y R B B Y Enter -RANGE> K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Close CCP door K,B,O Y R B B Y Composite Selection Device Comments Engage target using precision gunery (Option 4.1 or 4.2) but without larieg to target Y Case 9.2.0. GRR manually applies Tange Y Engage target using GAS (Option 9.10) Domain Composite Selection Device Comments Composite Selection Inconsistencies Comments Comments Composite Selection Device Comments Comments Composite Selection Device Comments Com	Case 9.2.C. TC	Indexed range	<u> </u>						
Enter -RANGE button K.3.0 Y N B B Y Enter -RANGE button K.8.0 Y N B B.0 Y Press ENTER button K.8.0 Y N B B Y Close CCP door K.8.0 Y N B B Y Domain Composite Selection Device Testable Heaningful Storage Repatition Inconsistencies Comments Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target Y Domain Composite Selection Device Testable Heaningful Storage Repatition Inconsistencies Comments Case 9.2.D. GRR manually applies Y Domain Testable Heaningful Storage Repatition Inconsistencies Comments Engage target using GAS (Option 9.10) Option 9.3. Engage target gives multiple returns free LRF Heasure Required Repetation Inconsistencies Comments Depress lase button(s) 8(0) Y N N B.0 Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <in mcters=""> K.8.0 Y N N B Y Switch LRF setting in accordance Setting appears at</in>									Comments
Enter *AANGE > K,B,O Y B B,O Y Press ENTER button K,B,O Y B B Y Close CCP door K,B,O Y B B Y Domain Testable Reaningful Storage Repetition Inconsistencies Comments Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target Y Domain Composite Selection Device Repetition Inconsistencies Comments Case 9.2.D. GRR manually applies Pange Y Engage target using GAS (Option 9.10) Composite Selection Device Comments Composite Selection Device Inconsistencies Comments Composite Selection Device Inconsistencies Comments Composite Selection Device Testable Neaningful Storage Repetition Inconsistencies Comments Composite Selection Device Testable Neaningful Storage Repetition Inconsistencies Comments Comments Option 9.3. Engage target given multiple returns free Laste Neaningful Storage Repetition Inconsistencies Comments Option 9.3. Engage target given multiple returns free Required Represented Node Feedback Storage Scoring Instructor Element Feedback Storage Scoring Festable Comments Pressented Node Feedback Storage Scoring Festable Comments Comments Setting appears at Console	Open CCP door		K,P,0	<u> </u>				<u> </u>	
Close CCP Goor K,B,O Y N B Y Close CCP Goor K,B,O Y N B Y Composite Testable Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target Case 9.2.D. GHR manually applies Fange Finge Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Composite Testable Testable Composite Testable Test	Press RANGE but	ton	K, 3, 0	<u>Y</u>				<u> </u>	
Close CCP door K,B,O Y N B B Y Domain Composite Selection Device Repetition Inconsistencies Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target Domain Composite Selection Device Repetition Inconsistencies Case 9.2.D. GMR manually applies Tastable Maningful Storage Repetition Inconsistencies Case 9.2.D. GMR manually applies Tastable Maningful Storage Repetition Inconsistencies Case 9.2.D. GMR manually applies Tastable Maningful Storage Repetition Inconsistencies Comments Domain Composite Selection Device Repetition Inconsistencies Comments Composite Selection Inconsistencies Comments Domain Testable Maningful Storage Repetition Inconsistencies Option 9.3. Engage target given multiple returns from LEF Weasure Element Automatic Recording Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comments Depress lase button(s) B(O) Y N B Y Switch LRF setting in accordance Setting appears at	Enter <range></range>		K,B,0	<u> </u>			8,0	<u> </u>	
Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target Domain Testable Y	Press ENTER but	ton	K,8,0	<u> </u>				<u> </u>	
Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target Domain Testable Meaningful Storage Repetition Device Testable Meaningful Storage Repetition Inconsistencies Comments Case 9.2.D. GMR manually applies Pange	Close CCP door		K,8,0	<u> </u>	<u></u> _			<u> </u>	<u> </u>
Domain Composite Selection Device Repetition Inconsistencies Comments Case 9.2.D. GHR manually applies Pange Pang								ies	Comments
Case 9.2.D. GNR manually applies range Y Selection Repetition Inconsistencies Comments Case 9.2.D. GNR manually applies range Y See 9.10 Engage target using GAS (Option 9.10) Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistencies Comments Domain Testable Meaningful Storage Repetition Inconsistencies Comments Deprise Required Required Represented Mode Feedback Storage Scoring Testable Comments Depress lase button(s) B(0) Y N B,0 Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <in heters=""> K,B,0 Y N B Y Switch LRF setting in accordance Setting appears at</in>	gunnery (Option but without las	4.1 or 4.2) ing to target							
Engage target using GAS (Option 9.10) Domain Composite Selection Device Testable Heaningful Storage Repetition Inconsistencies Comments URF Heasure Required Represented Hode Feedback Storage Scoring Testable Comments Depress lase button(s) B(0) Y N B,0 Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <im heters=""> K,B,0 Y N B Y Switch LRF setting in accordance Setting appears at</im>			Doma in	Composi	lte	Se lection	Dev ice		
Option 9.3. Engage target given multiple returns from LRF Measure Required Represented Mode Feedback Storage Scoring Testable Comments Depress lase button(s) B(0) Y N B, O Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <in meters=""> K,B,O Y N B Y Switch LRF setting in accordance Selection Device Comments Comments Laccording Instructor Element Scoring Testable Comments Comments Laccording Instructor Element Scoring Testable Comments Secting appears at Console Setting appears at</in>								See S).10
Option 9.3. Engage target given multiple returns from LRF Heasure Required Represented Mode Feedback Storage Scoring Testable Comments Depress lase button(s) B(0) Y M B,0 Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <in heters=""> K,B,0 Y M B Y Switch LRF setting in accordance Setting appears at</in>		sing GAS							
Heasure Required Represented Hode Feedback Storage Scoring Testable Comments Depress lase button(s) B(0) Y N B,0 Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <in heters=""> K,B,0 Y N B Y Switch LRF setting in accordance Setting appears at</in>	Option 9.3. Engage	target given	Doma in	Compost	te	Se lect ion	Device		
Required Represented Mode Feedback Storage Scoring Testable Comments Depress lese button(s) B(0) Y N B,0 Y Range appears at console If multiple return symbol appears in GPS, announce RANGE <in heters=""> K,B,0 Y N B Y Switch LRF setting in accordance Setting appears at</in>	The state of the s	He reterns from	Υ						 -
If multiple return symbol appears in GPS, announce RANGE <in meters=""> K,B,O Y N B Y Switch LRF setting in accordance Setting appears at</in>									Comments
appears in GPS, announce RANGE <in meters=""> K,B,O Y N B Y Switch LRF setting in accordance Setting appears at</in>	Depress lase butto	on(s)	8(0)	<u> </u>	<u> </u>		8,0	<u> </u>	Range appears at console
	appears in GPS, as	nounce	K,8,0	<u> </u>				<u> </u>	
			K,B,0	Υ	<u> </u>		8,0	<u> </u>	Setting appears at console

Activity 9. ENGAGE TARGETS USING REPLACE GUNNERY TECHNIQUES (cont'd) Case 9.3.A. Gunner relases	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistenci	<u></u>	Comments
	Measure Required	Element Represented		tic Recording			Comments
Relay on target	8(0)	<u> </u>	N No	t Used 1		Y	
Depress lese button(s)	8(0)	<u> </u>		epared SM Scot		<u> Y</u>	
Continue with engaging Main target using precision gunnery (Option 4.1 or 4.2)			Storage	Selection Repetition		_	
Case 9.3.B. TC corrects range							
Continue with engaging main target using precision gunnery (Option 4.1 or 4.2)							
	Domain Yestable	Composi Meaningful		Selection Repetition I	Device Inconsistencia		Comments are no exercises for
Option 9.4. Engage target given no range display (loss of symbology)				By special instruction		this c simula knob a	ondition, but it can be ted by turning SYMBOL Il the way down
Case 9.4.A. Little or no time	<u> </u>						1/4.2
Engage target using precision gunnery (Option 4.1 or 4.2)							
Case 9.4.8. Time permitting	<u> </u>						
	Heasure Required	Element Represented		tic Recording edback Storage			Comments
Open CCP door	K,8,0	<u> </u>	<u> </u>		<u> </u>	Υ	
Press RANGE button							
Press wange parton	K,B,0	<u> </u>	<u> </u>		. .	Υ	

Activity 9. ENGAGE TARGETS USING REPLACE GUNNERY TECHNIQUES (cont'd) Option 9.5. Engage target given crosswind failure	Domain Composite Selection Device Testable Heaningful Storage Repetition Inconsistencies Comments (Y) - Instruction There are no crosswind senso failure engagements Heasure Element Required Represented Hode Feedback Storage Scoring Testable Comments	
Open CCP door	K,B,O Y N B Y	_
Press CROSSWIND button	K,B,O Y N B Y	_
Press "0" key	K,B,O Y N B Y	_
Press ENTER button	K,B,O Y N B Y	
Close CCP door	K,B,O Y N B Y	_
	Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistencies Comments	
Engage target using precision gunnery (Option 4.1 or 4.2)		_
Option 9.6. Engage target given cant sensor failure	By special There are no cant sensor Y instruction failure engagements	
	Measure Element Automatic Recording Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comments	
Open CCP door	K,B,O Y N B Y	
Press CANT button	K,B,O Y N B Y	_
Press "0"	K,B,O Y H B Y	_
Press ENTER button	K,B,O Y N B Y	
Close CCP door	K,B,O Y N B Y	
	Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistencies Comments	
Engage target using precision gunnerystationary (Option 4.2)	(Y) - See 4.2	
	Measure Element Automatic Recording Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comments	_
If tank is not on level ground, compensate by aiming 1 mil high/1 mil opposite direction of cant per 1000 meters in range to target 10	Adjusting for "cent" w KEB(O) Y N O Y result in a miss	111

¹⁰ Dutcome is corrected sight picture.

	ENGAGE TARGETS USING REPLACE GUNNERY TECHNIQUES (cont'd)	Domain Testable	Compos <u>Meaningful</u>		Selection Repetition	Device Inconsistence	Lead	Comments angle failure is not
Option 9.7.	Leed angle sensor failure	N						lated separately from OUT
		Heasure Required	Element Represented		tic Recording		Element	Comments
Open CCP do	or	K,8,0	<u> </u>				<u> </u>	
Press LEAD !	button	K,B,0	<u> </u>	<u></u>		- 8	<u> </u>	
Press "0" ke	ıy	K,B,0	<u> </u>			<u> </u>	<u> </u>	
Press ENTER	button	K,8,0	Υ	<u></u>			<u> </u>	
Close CCP de	por	K,8,0	<u> </u>	<u>* </u>		8	<u> </u>	
gunnery (Opt		K.B.O	Y			0	٧	Observe from console
Option 9.8.	GPS failure (day channel)		Compost Meaningful Not specific to option	Storage	Selection Repetition		GPS 1	Comments allure is not simulated ately from TIS failure
Engage targe (Option 4.4)	et using TIS							
Option 9.9.	Engage target given GPS/TIS failure	<u> Y</u>	Not specific to option					
199727	L. Engage target given GPS/TIS failure		Incorrect					9.10
(Option 9.					• • • • • •			
	. Use GAS battlesight techniques	<u> </u>						
gunnery (0	get using battlesight option 9.1) but instead of GPS							

¹¹Outcome is corrected sight picture.

Activity 9. ENGAGE TARGETS USING REPLACE GUNNERY TECHNIQUES (cont'd) Option 9.10. Engage target using GAS	Domain Testable		Storage	Selection Repetition	Device Inconsistenc	Corr	Comments ect lay does not result hit
	Heasure Required	Element Represented		itic Recording medback Storage		Element Testable	Comments
Set/check switches: FIRE CONTROL MODE: NORMAL LRF: ARM LAST RTN GPS: 3X GUN SELECT: MAIN AMMO SELECT as announced	K.B.(0)	Y	*		8,0		Gun Select or LRF early Switch settings can be observed at console
Sight through GAS	K,8,0		<u> </u>				
Grasp palm switches	K,8,0	<u> </u>				<u> </u>	
Announce IDENTIFIED	K,B	<u> </u>	<u> </u>		<u> </u>	<u> </u>	Fed in by instructor
Lay announced range line on target	8(0)	<u> </u>	<u>0 R</u>	eplay S		<u> </u>	Judge sight picture at console
If target is moving, apply lead as follows: . 2.5 mils for sabot							Judge sight picture at
. 5 mils for HEAT12	8(0)	<u> </u>	<u>O</u> R	eplay S		<u> </u>	console
Listen for FIRE ⁶	<u>K,0</u>	<u> </u>	#			<u> </u>	
Announce ON THE WAY	<u>K,B</u>	<u> </u>	<u></u>		<u> </u>	<u> </u>	Correctness of sight
Squeeze trigger(s) ⁵	8,(0)	<u> </u>	<u> </u>	eplay S		<u> </u>	
Continue tracking ⁴	8,(0)	<u> </u>	<u>0</u> R	eplay S			picture judged at console
Option 9.11. Engage target given stabilization system failure (emergency		Compost	te	Selection	Device		Comments
mode)	Heasure Required	Element Represented		tic Recording			Comments
Set/check switches: FIRE CONTROL MODE: NORMAL LRF: ARM LAST RTN GPS: 3X GUN SELECT: MAIN AMMO SELECT as announced	K,B,(0)	<u> </u>	<u>N</u>		8.0	<u> </u>	Gun Select or LRF early Switch settings can be observed at console
Sight through GPS	K,B,0	<u> </u>				<u> Y</u>	

¹² Outcome is corrected sight picture.

Activity 9. ENGAGE TANGETS USING REPLACE GUMMERY TECHNIQUES (cont'd)	Heasure Regulred	Element Represented	Automatic Recording Mode Feedback Storage			Comments
Grasp palm switches	K,B,0	у	<u> </u>		<u> </u>	
Announce IDENTIFIED	K,B	<u> Y</u>	<u> </u>		<u> </u>	Fed in by instructor
If target is moving, apply lead as follows: . 2.5 mils for sabot				500		Judge sight picture at
. 5 mils for HEAT ¹³	K&B(0)	<u> </u>	O Replay S		<u> </u>	conso le
Listen for FIRE	K,0	Y	<u> </u>	0	<u> </u>	
Announce ON THE WAY	K,B	<u> </u>	<u></u>	8	<u> </u>	
Squeeze trigger(s) ⁵		<u> </u>	O Replay 5	0	<u> </u>	Correctness of sight picture judged at console Correctness of sight
Continue tracking ⁴	8,(0)	<u> </u>	O Replay S	0	<u> </u>	
Option 9.12. Engage target given turret power failure (manual mode)	Domein Testable	Composi Meaningful	ite Selection Storage Repetition I	Device nconsistenc	iles	Comments
	Heasure Required	Element Represented	Automatic Recording Mode Feedback Storage			Comments
Set/check switches: FIRE CONTROL MODE: NORMAL LRF: ARM LAST RTN GPS: 3X GUN SELECT: MAIN AMMO SELECT as announced	K,B,(0)	Ψ	<u>N</u>	<u>B,0</u>	<u> </u>	Gun Select or LRF early Switch settings can be observed at console
Sight through GAS	K,8,0		<u>H</u>			
Traverse/elevate with manual controls	B(0)	<u> </u>	<u> </u>	8,0	<u> </u>	Outcome is changing at console
Announce IDENTIFIED	K,B					
Lay announced range line on target 14	KAB(0)	<u> </u>	O Replay S		<u> Y</u>	Judge sight picture at console
If target is moving, apply lead as follows: . 2.5 mils for sappt						Judge sight picture at
. 5 mils for HEAT ¹³	<u>K&B(0)</u>	<u> </u>			<u> </u>	console
Listen for FIRE ⁶	<u>K,0</u>	<u> </u>	<u> </u>		<u> </u>	
Announce ON THE WAY	K,B		<u> </u>		<u> </u>	
Press elevation knob firing trigger 16	8(0)	<u> </u>	O Replay \$		<u> </u>	Judge sight picture at console
If gun fails to fire, vigorously turn blasting machine handle 3-4 times ¹⁵	_B(O)	<u> </u>	O Replay S	0	<u> </u>	Judge sight picture at console

¹³ Outcome is corrected sight picture.

 $^{^{14}\}mathrm{Outcome}$ is range line on target.

¹⁵Outcome is corrected sight picture.

 $^{^{16}\}mathrm{Outcome}$ is sight picture at time of firing.

Testing Capabilities of UCOFT on Gunner Activities

Activity 10. ENGAGE TARGET FROM TC POSITION		
Testing this activity	is not reted for the gunner.	
Case 10.1. <u>Sunner cannot identi</u> <u>terget:</u>	<u> </u>	
(See Activity 4.3)		
	••••••••••••	• • • •
Case 10.2 Three-men crew		
No gunner		
•••••••••••	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistencies Comments	
Activity 11. ASSESS RESULTS OF ENGAGEMENT		ons
	Measure Element Automatic Recording Instructor Element Required Represented Hode Feedback Storage Scoring Testable Comments	
Check/adjust MRS	K,B,O Y N	
Index battlecarry ammo	K,8,0 Y N 8,0 Y	
Announce <ammo> INDEXED</ammo>	K,B Y N B Y	

APPENDIX 1 - 5 TESTING CAPABILITIES OF SIMMET ON GUNNER ACTIVITIES

Activity 1. PREPARE STATIONS FOR OPERATION	Domain Composite Selection Device Testable Heaningful Storage Repetition Inconsistencies Comment H Too many missing e	
	Measure Element Automatic Recording ² Instructor Element Required Represented Mode Feedback Storage Scoring ³ Testable Comm	ents
Enter gunner station	K,8,0 N N	
Operate domelight	K,B,O (Y) N B Y	
Operate intercom	K,B,O (Y) H Y	
Install coax	K,B,O N N	
Adjust seats	K,8,0 N N	
Adjust browpeds	K,8,0 H H	
Adjust chestrest	K,B,O	
Power up station	K,8,0 Pertie) (8) N	
Perform GPS function check	K,8,0 Partial (8) H	
Adjust GPS	K,8,0 N N	
Perform computer self-test	K,B,O N N	
Perform computer data check	K,B,O N N N N N N N N N N N N N N N N N N N	
Perform TIS check	K,B,O N N N	
Perform GAS adjust	K,B,O N N	
Check power control handles	K,B,O N N	
Check manual elevation/traverse cranks	к.в.о н п	
Perform lead system check	K,0,0 N N	
Perform firing circuits check	<u>к,в,о</u> <u>и</u>	
Perform crosswind sensor check	к,в,о <u>и</u>	
Perform hydraulic pressure check	K,8,0 N N	

¹SIMMET provides no composite scores, therefore these two columns are left blank for the entire domain.

²SIMMET has no automatic scoring capabilities. However, there is a real-time remote plan-down display with memory capture for replay. Therefore, possibilities for an instructor scoring from the plan-down display are described.

Ratings in this column assume instructor is acting as TC. This allows use of GPSE to observe sight picture. Otherwise, testing would require at least two observers: one inside crew compartment to observe behaviors and another outside using optional monitor to evaluate sight picture. While feasible, the use of two observers is not very practical.

Testing Capabilities of SIMMET on Gunner Activities

Activity 2. PERFORM PREPARE- TO-FIRE CHECKS	Dome in Testable	Compost Meaningful	Storage Repetition	Device Inconsistenc	<u> </u>	Comments
	Heasure Required	Element Represented	Automatic Recording Hude Feedback Storage			Comments
Boresight main gun	K&8,(0)				N	
Zero coex	KAS, (0)			- —		
Report weapon status ⁴	<u>K.B</u>	<u> </u>			Υ	
Index bettlecarry aumo on				_		
APPID SEL switch	K,B,0	<u> </u>	<u></u>		<u> </u>	
Introduce battlecarry range into CCP	K,8,0					
Option 2.1. Prepare for offense	Doma In	Compos1	te Selection Storage Repetition	Dev ice		Comments
option 2.11. Propare 100 erronae	Measure	Element Represented	Automatic Recording Mode Feedback Storage			Comments
Receive TC briefing	K	<u> </u>	<u> </u>			No observable behavior
Option 2.2. Prepare for defense	Domain Testable	Compost Meaningful		Device Inconsistenci		
	Measure	Element	Automatic Recording			Comments
	Required	Represented	Mode Feedback Storage	Scoring	IA2CED IA	
Inspect terrain through GPS/TIS	100				200707	No TIS; No observable behavior
Inspect terrain through GPS/TIS Check GAS clearance	K(K)	Degraded				No observable behavior

⁴Outcome is TC knowing correct information.

	Domain Testable	Composite Meaningful Stor	Selection age Repetition	Device Inconsistencies	Comments
Activity 3. ACQUIRE TARGET(S)					Missing and degraded elements
Part 3.1 Search					
Option 3.1.1. Open hatch - day					
• • • • • • • • • • • • • • • • • • • •	Dome in	Composite	Se lect ion	Device	Comments
Option 3.1.2. Closed hatch - day	<u>(Y)</u>		_		
	Measure Required			ng Instructor Ele ige <u>Scoring</u> Test	ement table Comments
Select 3X GPS/TIS magnification	K,8,0	<u> </u>			<u> </u>
Search on gun axis using GPS	K,8,0	<u> </u>			<u> </u>
Alternate using GPS with TIS	K.(B.0)				<u> </u>
Execute search techniques to acquire targets	_ K	<u> </u>			Mo observable behavior
• • • • • • • • • • • • • • • • • • • •	Dome in	Composite	Se lect ion	Dev 1ce	Comments
Option 3.1.2. Hight					•
	Measure Required			ng Instructor Ele nge <u>Scoring</u> <u>Test</u>	ment table Comments
Search on gun exis using TIS					No TIS
	Dome in	Composite	Se lection	Device	Comments
Part 3.2. Detection/Location/ ID/Reporting				At the second live and a second	Simulation may reduce validity
	Measure	Element Au	tomatic Recordin	g Instructor Ele	
Detect target(s)/signature(s) obstacle(s)	K(K)	Degraded N	- 		No observable behavior or outcome
Locate target(s)	K(K)	<u> </u>			No observable behavior or outcome

⁵There are enough different patterns of cues to look for that detection is more complex than simple observation.

ctivity 3. ACQUERE TARGET(S) (cont'd)	Measure Regulated	Element Represented	Automatic Recording	Element Testable	Connents
dentify target(s) making the					
ollowing determinations:					No observable behavior
Nomenc lature	K(K)	Degraded	<u></u>	 <u> </u>	or outcome
f target detected, announce					
TARGET> <location></location>	K,B	Ψ	.L	 Y	
					No observable behavior
onfirm target	K,(B,0)	<u> </u>	<u>H</u>	 <u> </u>	or outcome
stimate range (approximate in					
rder to evaluate LRF return)	K	Degraded	N	 <u> </u>	

[No gunner actions]

	Dome in	Compos	316	Se lection	Device Incomistant	100	Counents
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN	_(Y)				4 neons 1 steric		Commits
Option 4.1. Precision engagement - moving (offense)	<u> </u>						
	Heasure Required	Element Represented		itic Recording medback <u>Storag</u>			Comments
Set/check switches: 'FIRE CONTROL MODE: NORMAL 'LRF: ARM LAST RTN 'GPS: 3X 'GUN SELECT: MAIN 'APMO SELECT as announced	KSB, (0)	Υ	<u> </u>		<u> </u>	<u> </u>	•
Sight through GPS	K,B,0	<u> </u>	<u>* </u>		(1)	<u> </u>	
Grasp palm switches	K,B,0	Υ				<u> Y</u>	
Announce IDENTIFIED	K,8	<u> </u>				<u> </u>	· · · · · · · · · · · · · · · · · · ·
witch GPS to 10X	K,B,0	<u> </u>				<u> </u>	
ay on center mass of target ⁶	8,(0)	<u> </u>	1		0	<u> </u>	
legin tracking moving targets 1	8,(0)	Υ	<u> </u>		0	<u> </u>	
isten for driver alerts	K	Υ	<u> </u>				Mo observable behavior
Depress lase button(s)	8,(0)	<u> </u>	<u> </u>			<u> </u>	
Evaluate range display ⁸	<u> </u>	Degraded	<u> </u>			<u> </u>	
Check ready-to-fire and fault symbols	K,0	Y	<u> </u>			<u> Y</u>	
Make control lay ¹	8,(0)	<u> </u>	*			<u> </u>	
isten for UP ¹⁰	K,0	Υ	н		<u> </u>	<u> </u>	
isten for FIRE ⁴	<u>K,0</u>	<u>Y</u>					
Announce ON THE WAY	K,B	<u> </u>	N _		<u> </u>	<u> </u>	
iqueeze trigger(s) ²	B,(0)	Υ	0 h1	rget t <u>Y</u>	0	<u> </u>	
Continue tracking 1	8,(0)	Y	N		0	Y	

⁶For this element and similar elements throughout the entire domain, the relevant outcome is the sight picture.

⁷For element and similar elements throughout the entire domain, the relevant outcome is the sight picture at the time of lasing/firing.

⁸For this element and similar elements throughtout the domain, the relevant outcome is implementing activities 9.2 or 9.3 or relaxing.

⁹ For this and similar elements throughout the entire domain, the outcome is firing only if the ready-to-fire signal is visible.

¹⁰ for this element and similar elements throughout the entire domain, the relevant outcome is firing only after UP and FIRE are announced.

Activity 4. ENGAGE SINGLE TARGETS

ACCIVILY 4.	WITH THE MAIN GUN							
	(cont'd)	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistenc	les	Comments
Option 4.2.	Precision engagement		- W	44			iii	. =:==10
28 12000	- stationary (defense)	<u>(Y)</u>						
		Heasure Required	Element Represented		tic Recording edback Stores			Comments
Set/check so FIRE CONTI NORMAL	ROL MODE:	K.B. 0		<u> </u>			<u> </u>	
' LRF: ARM I	LAST RTW							
. UN SELEC	T: MAIN CT as announced							
Sight throug	gh GPS	K,B,0	<u> </u>	<u> </u>			<u> </u>	
Grasp palm :	witches	K.B.0	<u> </u>	<u>*</u> _			<u> </u>	
-	n GAS to determine mars defilade	K,B,0	N	<u></u>				
Announce DR	EVER STOP	K,B	<u> </u>				<u> </u>	
Look through	GPS	K,8,0	<u> </u>	<u>#</u> _			<u> </u>	
Announce IDE	ENTIFIED	K,B	<u> </u>	<u>*</u>		8	<u> </u>	
Switch GPS 1	to 10X	K,8,0	<u> </u>	#			<u> </u>	· · · · · · · · · · · · · · · · · · ·
Lay on cente	er mass of target	B(0)	Υ				<u> </u>	
Begin track	ing moving targets	8(0)	<u> </u>				<u> </u>	
Depress lase	button(s)	B(0)	Y				<u> </u>	
Evaluate ran	nge display	K,0	Degraded	<u> </u>			<u> </u>	
Check ready- symbols	-to-fire and fault	K,0	ΥΥ	<u></u>			<u> </u>	
Make contro	l ·lay	8(0)	<u> </u>	<u> </u>				
Listen for t	IP .	K,0	<u> </u>	<u> </u>			<u> </u>	
Listen for f	FIRE	<u>K</u> ,0	<u> </u>	N			<u> </u>	
Announce ON	THE WAY	8(0)	<u> </u>	N 7a	roet		Υ	
Squeeze trig	gger(s)	B(0)	<u> </u>				<u> </u>	
Continue tra	ick ing	8(0)	Υ	<u> </u>			<u> </u>	
					•			

Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUM					
(cont'd)	Dome in	Composite	Se lect ion	Bevice	
(come d)		Meaningful Sto		Inconsistencies	Comments
Option 4.3. Gunner cannot identify announced			<u> </u>		
terget	/V1				
en pec					
Case 4.3.A.: GMR fails to ident target(s)	Ify Y				
	Measure	Element A	utomatic Recordin	g Instructor Element	
	Required	Represented Mo	de Feedback Stora	ge Scoring Testable	Comments
Announces CANNOT IDENTIFY or	1 - 177 mile				
does not respond	K(B)	Y N		B Y	
					
	Doma in	Composite	Selection	Device	
	Testable	Meaningful Stor	rage Repetition	Inconsistencies	Comments
					100000
Case 4.3.8.: GNR identifies different target	<u> </u>			/	
	Heasure	Element A	stametic Recordin	g Instructor Element	
				ge Scoring Testable	Comments
	1000	Nopresented 140	<u> </u>	<u> </u>	- Commence
Announces IDENTIFY					
OIFFERENT TARGET>	K(8)	Y N		8 Y	
			7		
	Dome in	Composite	Se lect ion	Device	
		Heaningful Stor		******	Comments
	110000			A TIME IN CO.	
Option 4.4. Use TIS				Mo T	S

	Dome in Testable	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
Activity 5. ADJUST FIRE	Partial_	Degraded mode not represented
	Heesure Required	Element Automatic Recording Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Recover sight picture	K,B	
Observe/announce strike of every round	K	<u> </u>
Option 5.1. Reengage	Domain Testable (Y)	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
option all manages	Heasure Required	Element Automatic Recording Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Announce REENGAGING	K,B	<u>Y H B Y </u>
Release/reengage palm switches	K,B	<u>y</u> <u>B</u> <u>Y</u>
Lay center of mass	8(0)	<u> </u>
Begin tracking moving target	8(0)	Y N 0 Y
Depress lase button(s)	8(0)	<u> </u>
Evaluate range display	K,0	Degraded N B Y
Check ready-to-fire and fault symbols	K,0	<u>Y H B Y </u>
Listen for UP	K,0	<u>Y N B Y </u>
Announce ON THE WAY	K,8	<u>Y H B Y </u>
Squeeze trigger(s)	8(0)	<u>Y</u> <u>N</u> <u>O</u> <u>Y</u>
Continue tracking	8(0)	<u>Y</u> M <u>0</u> Y
•••••	Dome in Testable	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
Option 5.2. Standard adjustment (degraded mode)		Degrade mode not presented
	Domain Testable	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
Option 5.3. TC adjustment	_(Y)_	
	Heasure Required	Element Automatic Recording Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Release/reengage palm switches	K,B,0	<u>Y</u> H B Y
Apply TC correction ¹	KAB(0)	<u> </u>
Listen for UP	K,0	<u>Y</u> H <u>8</u> Y
Announce ON THE WAY	K,B	<u> </u>
Squeeze trigger(s)	B(0)	<u> </u>
Continue tracking	8(0)	<u> </u>

Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		Composite Heaningful Storage			Comments SIMMET does not simulate coax
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUM	Domain Testable	Composite Meaningful Storage		W	7-2-1-1
Engage first target using precision gunnery (Option 4.1 or 4.2)	<u> </u>				
If first target is not destroyed, adjust fire as described in Activity 5	<u> </u>				
Engage second target using precision gunnery (Option 4.1 or 4.2)	<u> </u>				
••••••		***************************************	**********	***************************************	•••••••
Activity 8. EMGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMUL- TAMEDUS MAIN GUM	Domain Testable	Composite \(\) Heaningful Storage	Selection Repetition	Device Inconsistencies	Comments
ENCACEMENTS	<u> </u>				SIMMET does not simulate cal .50

	Domain Testable	Composite Meaningful Storage	Selection Repetition	Device Inconsistencies	Comments
Activity 9. ENGAGE TANGETS USING DEGRADED GUNNERY TECHNIQUES					Only battlesight and multiple return available
Option 9.1. Engage targets using battlesight gunnery	<u>(Y)</u>				
	Measure Required			Instructor Ele e Scoring Tes	ement table Comments
Set/check switches: ' FIRE CONTROL MODE: NORMAL ' LRF: SAFE ' GPS: 3X ' GUN SELECT: MAIN ' AMMO SELECT: battlecarry ammo	K,B,0	<u> </u>			<u>, </u>
	Domain Testable	Composite Meaningful Storage	Selection Repetition	Device Inconsistencies	Comments
Engage target using precision gunnery (Option 4.1 or 4.2) but without lasing to target	•				
• • • • • • • • • • • • • • • • •				• • • • • • • • • • • • • • • • • • • •	••••••
Option 9.2. Engage target given ineffective LRF	<u> </u>	 .	 -		Not presented
Option 9.3. Engage target given multiple returns from LRF					
	Heasure Regulired			Instructor Ele e Scoring Test	ement sable Comments
Depress lase button(s)	8(0)	<u> </u>			
If multiple return symbol appears in GPS, announce RANGE <im meters=""></im>	K,B,0	<u> </u>			
Switch LRF setting in accordance with TC instructions	K,B,0				·

Activity 9. ENGAGE TARGET USING BEGRADED GUNNERY TECHNIQUES	Domain Testable	Compos <u>Heaningful</u>		Selection Repetition	Device Inconsistenci	<u></u>	Comments
Case 9.3.A. Gunner relases							
	Measure Required	Element Represented			Instructor Scoring		Comments
Relay on target	8(0)	Υ				Υ .	
Depress lase button(s)	8(0)	Y				Υ	
Continue with engaging main	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistencia	<u></u>	Comments
target using precision gunnery (Option 4.1 or 4.2)	<u> </u>			 .			
Case 9.3.8. TC corrects range	<u> </u>						
Continue with engaging main target using precision gunnery (Option 4.1 or 4.2)							
Option 9.4. Engage target given ne range display (less of symbology)							esented
Option 9.5. Engage target given cresswind failure							esented
Option 9.6. Engage target given cant sensor failure						• • • • •	esented
Option 9.7. Lead angle sensor failure				 -			esented
Option 9.8. GPS failure (day channel)							
Option 9.9. Engage target given GPS/TIS failure							
Option 9.10. Engage target using GAS							
Option 9.11. Engage target given stabilization system failure (==ergency		• • • • •	• • • •	• • • • •	• • • • • •		
Option 9.12. Engage target given turret power failure	. .:	•••••	 .	 -		Not pro	esented
(manual mode)	<u> </u>					Not pre	sented

Testing this activity is not rated for the gunner.

Activity 10. ENGAGE TARGET FROM TC POSITION

•••••••••••••••••••••••••••••••••••••••	
	Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistencies Comments
Activity 11. ASSESS RESULTS OF ENGAGEMENT	_(Y)
	Heasure Element Automatic Recording Instructor Element Required Represented Hode Feedback Storage Scoring Testable Comments
Check/edjust MRS	K,8,0 N N
Index battlecarry ammo	K,B,O Y B Y
Announce <ammo> INDEXED</ammo>	K,8 Y

APPENDIX I - 6 TESTING CAPABILITIES OF UCOFT ON TANK COMMANDER ACTIVITIES

	Domain Testable	Compost <u>Meaningful</u>	ite Selection Storage Repetition 1	Device nconsistencie	<u> </u>	Comments
Activity 1. PREPARE STATIONS FOR OPERATION					Many	missing elements
	Heasure Required	Element Represented	Automatic Scoring Mode Feedback Storage		lement estable	Comments
Enter station	K,B,0				N	
Power up CWS/turret	K,B,0	<u> </u>	<u> </u>		Y	
Operate domelight	K,B,0	<u> </u>		8,0	Y	
Operate Intercom	K,8,0				N	
Adjust seat ¹	K,8,0	<u> </u>		8,0	<u> Y</u>	
Adjust hatch	K,B,0	N			N	
Adjust platform	K,8,0	<u> </u>			N	
Install TC's weapon	K,8,0				N	
Adjust kneeguard	K,8,0				N	
Adjust GPSE headrest/lens	K,B,0				N	
Check manual range controls	K,B,0	<u> </u>	<u>*</u>	8,0	Y	Observe range changes at console
Check power control handle	K,8,0	<u> </u>	<u> </u>	8,0	<u> Y</u>	Observe motion at console
Check CNS in power/manual modes	K,8,0	<u> </u>		8,0	Y	

¹Adjustment outcomes must be judged with reference to individual.

Activity 2. PERFORM PREPARE- TO-FIRE CHECKS	Domain Testable	Composite Selection Device Meaningful Storage Repetition Inconsistencies Comments
	Heasure Required	Element Automatic Scoring Instructor Element Represented Hode Feedback Storage Scoring Testable Comments
Supervise/assist boresight	K, BAO	
Boresight TC's weapon	KAB, (0)	
Zero TC's weapon	K&B, (0)	
Select/announce battlecarry AMMO, RANGE	K,(B)	<u> </u>
	Doma 1n	Composite Selection Device Heaningful Storage Repetition Inconsistencies Comments
Option 2.1. Prepare for offense		
	Measure Required	Element Automatic Scoring Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Receive offensive mission/ formation/movement/commo	K	Pre-engagement information Degraded N not analogous to OPORD
Analyze terrain	K(K)	N Scene degraded; no maps
Check map overlay	K(K)	
Brief crew	K,8,0	Not required by UCOFT; not sufficient information to brief crew
Control driver, if necessary to maintain position in plt formation and to		
exploit cover and concealment		
	Domain Testable	Composite Selection Device <u>Heaningful Storage Repetition Inconsistencies Comments</u>
Option 2.2. Prepare for defense		
		Element Automatic Scoring Instructor Element Represented Mode Feedback Storage Scoring Testable Comments
Issue driver commands to move with platoon to occupy battle position		<u> </u>
Receive defensive mission/ position commo	<u> </u>	
Prepare primary/alternate/ supplementary positions	_K,(8)	
Analyze terrain	K(K)	N Scene degraded; no maps
Prepare tank sketch card	K,(B,0)	

 $^{^{2}}$ Movement per se is primarily under driver's control. TC initiates movement and gives corrections.

Activity 3. ACQUIRE TABLET(S) Part 3.1 Search for Target(s)	1	Composite Heaningful Storage			Missing and degraded elements
Option 3.1.1. Search open hatch - day					Open hatch not simulated
Option 3.1.2. Search closed hetch - day	Heasure	Composite Heaningful Storage Element Autom Represented Hode F	atic Scoring	Instructor E1	
Search 360°	K,8,0				Hust traverse to search; K target all in front sector
Perform air guard duties	<u> </u>				M Cannot oberve search
Execute search techniques	<u> </u>				H techniques
Option 3.1.3. Search at night	Dome in Testable N Heasure Required		atic Scoring	Instructor E)	esent
Search 360 ⁰	K,8,0				<u> </u>
Use off-center vision	<u> </u>				<u> </u>

Activity 3. ACQUIRE TARGET(S) (cont'd) Part 3.2. Betect/Locate/Identify Target(s)	Domein Testable	Compos Meaningful	ite Selection Storage Fapetition I	Device nconsistenc		Comments lation may reduce validity
Detect target(s)/signature(s)/ obstacle(s) ³	Measure	Element	Autometic Scoring Mode Feedback Storage	Instructor Scoring	Element	
Locate target(s)	K(K)	Degraded	<u> </u>			No observable behavior
Identify target(s) by TFN Nomenclature	K(K)	Degraded				Ho observable behavior Would have to freeze exercise and ask TC what
Note number of target	K,0	<u> </u>		<u>K</u>	<u> </u>	he sev
Classify multiple targets as most dangerous/dangerous/ least dangerous	<u>K,(0)</u>		Error Recorded for Incorrect O Engagement	. <u> </u>		Evaluate fire command
Confirm acquisition report	K,(8,0)	<u> </u>	<u>. </u>	K		No observable behavior
Estimate range to select weapon(s) and to evaluate LRF return	K	Degraded		_ <u>K</u> _		Evaluate fire command
		Mixed with	Storage Repetition I	Device nconsistenci		
Part 3.3. Evaluate situation	Testable Degraded	Meaningful Mixed with other action	Storage Repetition I	nconsistenci	S famu 1	Comments ation may reduce validity
Part 3.3. Evaluate situation Decide whether or not to	Testable Degraded Heasure	Meaningful Mixed with other action Element	Storage Repetition 1	Instructor	\$1mu1	
Part 3.3. Evaluate situation	Testable Degraded Heasure	Meaningful Mixed with other action Element Represented	Storage Repetition 1 IS 11 Limited Automatic Scoring Hode Feedback Storage	Instructor Scoring	Simul Element Testable	
Part 3.3. Evaluate situation Decide whether or not to engage contingent on: Plt mission Platoon fire plan	Testable Degraded Heasure Required K,(0)	Heaningful Hixed with other action Element Represented	Storage Repetition 1 IS 11 Limited Automatic Scoring Hode Feedback Storage	Instructor Scoring	Simul. Element Testable	etion may reduce validity

 $^{^{3}}$ There are enough different patterns of cues to look for that detection is more complex than simple observation.

⁴Outcome is sequence of target engagement selected by TC.

Source is initiation of fire command.

⁶Outcome is ammunition annouced in fire command.

⁷Outcome is alert element of fire command.

Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN			Storage	Selection Repetition		day.	Comments
Option 4.1. Engage single target from the offense using procision gunnery		• • • • •	• • • • •	Limited	• • • • • •		
	Measure Required	Element Represented		itic Scoring medback Store			Comments
Issue contact report: CONTACT <direction> <target></target></direction>	K,B	ΥΥ				Υ	Not required by UCOFT
Decide whether to engage target while moving or from a short halt	K(K)_					<u> </u>	Can "stop" tank only in degraded mode exercises
If engaging from a short halt, issue driver command: DRIVER STOP	K,B	Υ	1			Y	
Relay any action drill command	K,B,0						
Issue fire command: GUNNER <aprio> <target>B</target></aprio>	K, (8)	Υ		corded		Υ	
Lay gun (simultaneous with fire command)	K,8,0	Υ			0.0	<u> </u>	Score by viewing motion on console
Release override	K, B, O	Y				<u> </u>	
Sight through GPSE	K.8.0	Υ				<u> </u>	Score at console
Evaluate range display	K.0	٧				Y	Occurrence depends on gunner
Listen for UP10	K	<u> </u>					
Announce FIRE, or FIRE, FIRE <alternate anno=""></alternate>	K,8						
		Compos Meaningful		Selection Repetition	Device Inconsistenc	les	Comments
Option 4.2. Engage single target from the defense usi							
precision gennery	<u> </u>	Comp lex	Partial	Limited			
Issue contact report: CONTACT	Heasure Required	Element Represented		tic Scoring edbeck Stores	Instructor <u>Scoring</u>		Comments
OIRECTION> <target></target>	<u>K,8</u>	Y				<u> </u>	***************************************
Issue fire cramend: GUNNER «AMMO» «TARGET» ¹¹	K,(8)	<u> </u>				<u> </u>	
Announce DRIVER MOVE OUT, GUNNER TAKE OVER	_K,8	Y				<u> </u>	
Lay gun (simultaneous with fire command)	K.B.0	<u> </u>				<u> </u>	
Release override	K.S.0	<u> </u>	<u>+</u> -			<u> </u>	

Assumes decisions were made in Part 3.3. Outcome is crew responding. May use reduced command.

⁹ If range appears incorrect, observable outcomes are indexing range or commanding gunner to relase.

¹⁰ Outcome is announcing FIRE only after hearing up.

 $^{^{11}}$ Assumes decisions were made in Part 3.3. Outcome is crew responding. May use reduced command.

ACCIVITY 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (cont'd)	Hoosure Required	Element Represented	Automatic So Hode Feedback		Instructor Scoring	Element Testable	Comments
Sight through GPSE	K,8,0	<u> </u>	*		0	<u> </u>	Score at console
Evaluate range display	K,0	<u> </u>	<u> </u>		0	Υ	Occurrence depends on gunner
Listen for UP	K,0	Y	<u>N</u>		_ 0	Υ	
Announce FIRE, or FIRE,FIRE <alternate ammo=""></alternate>	K,8	Υ				Y	
Option 4.3. Gunner cannot identify announced target	Domain Testable	Composi <u>Meaningful</u>	te Selec Storage Repet	tion tition In	Device consistenci	<u> </u>	Comments
Case 4.3.A.: Gunner fails to identify target(s)							
Direct gunner ento target using one of the following techniques: Verbal command: TRAVERSE			11-25-11-12-20-20-20-20-20-20-20-20-20-20-20-20-20	Storage	Scoring	Testable	Comments
<pre><left or="" right="">, STEADY, ON ' TRPs ' Announce MATCH MY TRACERS and use .50 caliber tracers to point to target OR</left></pre>							
Announce FROM MY POSITION and proceed with TC	Dome in Testable	Composi Meaningful			Device consistenci	<u></u>	Comments
engagement (see Activity 10)	<u> </u>						
Case 4.3.B. <u>Gunner identifies</u> <u>incorrect target(s)</u>							
If GMR is correct, issue a	Measure Required	Element Represented	Automatic Sc Hode Feedback	Storage	Scoring	Testab le	Comments
correction to the fire command	K,(8,0)	Υ	<u> </u>			Υ	
If GMR identifies the wrong	Dome in Testable	Compost <u>Heaningful</u>	te Selec Storage Repet	-	Device consistenci	<u></u>	Comments
target, treat as Case 4.3.A. and proceed	<u> Y</u>						· - · · · · · · · · · · · · · · · ·
Option 4.4. Engage target using TIS	Domain Testable	Composi Heaningful	te Selec Storage Repet		Device consistenci	es	Comments
Engage targets using precision gunnery (Option 4.1 or 4.2) ¹²							

 $^{^{12}}$ When element references another part of the domain, classifications for referenced section apply.

	Domain Testable	Composite Selection Repetition	Device Inconsistencies	Comments
Activity 5. ADJUST FIRE	<u> </u>			
	Required	Element Automatic Scoring Represented Hode Feedback Store	Instructor Element age Scoring Testable	
Recover sight picture	K,8	Degraded N		
Observe strike of round	<u> </u>	Degraded H		
If TARGET was observed, determine whether or not target was destroyed	<u> </u>	N 0		
	Dome in	Composite Selection	Device	
	WHEE	leaningful Storage Repetition	Inconsistencies	Comments
Option 5.1. Use reengage technique	Υ			
	Heasure Regulred	Element Automatic Scoring epresented Mode Feedback Stora	Instructor Element Instructor Element Instructor Element Instructor Element Instructor Element Instructor Element	
Evaluate range display	<u>K,0</u>	<u> </u>	<u> </u>	gunner depends on
Announce FIRE		<u>Y</u> <u>H</u>		
Option 5.2. Use standard adjustmen				
No TC actions specified				
	Doma 1n	Composite Selection leaningful Storage Repetition	Dev1ce	
Option 5.3. Use TC adjustment				
	<u> </u>			
Issue subsequent fire command	Heasure	Element Autometic Scoring epresented Mode Feedback Store		Comments
to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	Heasure Required	epresented <u>Mode Feedback Store</u>	ige Scoring Testable	Determine appropriate correction and score from
to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in	Heasure Required	epresented <u>Mode Feedback Store</u>	ige Scoring Testable	Determine appropriate
to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	Heasure Required	epresented Mode Feedback Store	see Scoring Testable	Determine appropriate correction and score from

Activity 6. ENGAGE A SINGLE	Domain Testable	Composite Meaningful Store	Selection ige Repetition	Device Inconsistencies	Comments
TARGET WITH THE COAX		Complex Part	al Limited		
	Heasure Required	Element Aut Represented Hode Time			
Issue fire command: GUNNER COAX <target>13</target>	K,8	Y Anno	Displayed S		Y Ammo keyed in by I/O
Lay gum (simultaneous with fire command)	K,B,0	<u> </u>			Observe sight picture at Y console
Release override	K,B,0	<u> </u>			Υ
Evaluate range display	K,0	<u>Y</u> <u>N</u>			Occurrence depends on gunner
Announce FIRE	K,8	<u> </u>			
Monitor/evaluate engagement	<u>K</u>	<u> </u>	. 		<u> </u>
Command CEASE FIRE	K,(8)	<u> </u>			Υ
••••••	••••••		************		***************************************
Activity 7. ENGAGE MULTIPLE	Domain Testable	Composite Meaningful Store	Selection ge Repetition	Device Inconsistencies	Comments
TARGETS WITH THE MAIN GUN	_(Y)				Severe time limits reduce testing utility
Issue fire command:	Heasure Required	Element Aut Represented Hode	omatic Scoring Feedback Storag	Instructor El	
SUMMER <ammo> <mumber> <targets>, <right left=""> <targets first<="" td=""><td>K,B</td><td>Υ 8</td><td>Target Order Scored S</td><td></td><td>Y</td></targets></right></targets></mumber></ammo>	K,B	Υ 8	Target Order Scored S		Y
	Dome 1n	Composite Heaningful Stora	Se lect ion	Device	
Engage first target using precision gunnery (Option 4.1 or 4.2)	<u> </u>	Complex		Tomber Hards	
If first target is not destroyed, adjust fire (Activity 5)	Y	Comp lex			
	Heasure Required	Element Aut Represented Hode		Instructor El	table Comments
If first target is destroyed, announce <next> TARGET</next>	r (8)	<u> </u>			Severe time limits may prevent crew from getting
	- K. (B)				this far
[Continue until all targets are destroyed]					this for

¹³ Assumes decisions were made in Part 3.3. Outcome is crew responding.

		Dome in	Compos	ite	Se lect ion	Dev Ice		
		Testable	Heaningful	Storage	Repetition	Inconsistenc	les	Comments
Activity 8.	ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMUL- TAMEOUS MAIN GUN			ires			min.	
	ENGAGEPENTS)	<u> </u>	Comp lex	<u>Pertial</u>	Limited			
Option 8.1.	Simultaneous targets	<u> </u>						
		Measure Regulated	Element Represented		tic Scoring edback Storag	Instructor		Comments
Issue fire								
FIRE AND AD	D> <target>, Just ¹⁴</target>	<u>K,8</u>	Y	<u>.</u>			<u> </u>	C
•		Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistenc	les	Comments
Option 8.2.	Cal .50 targets	<u> </u>	Comp lex	<u>Partial</u>	Limited			
		Heasure Required	Element Represented		tic Scoring edback Storag	Instructor <u>Scoring</u>		Coments
Announce: (CALIBER .50 ¹⁴	K,B	<u> </u>	1			<u> </u>	
Charge TC's	weapon	K,B,0	<u>""</u>					Osbserve at console Outline is range line
Lay weapon (for deflection	B, (0)	<u> </u>	1			<u> </u>	selected in next stp
Estimate rai	nge to target	<u>K</u>	Degraded	1				Observe at console
Lay CWS sigi	nt range line on target	8,(0)	<u> </u>	1			<u> </u>	Observe at console
Fire bursts	of 10-15 rounds	8,(0)	<u> </u>	<u>H</u>			<u> </u>	Observe at console
Adjust fire	if needed	8,(0)	<u> </u>	<u> </u>			<u> </u>	Observe at console
If target 1: announce TC	s destroyed, COMPLETE	K,(B)_	<u>y</u>				<u> </u>	

 $^{^{14}\!\}mathrm{Assumes}$ decisions were made in Part 3.3. Outcome is crew responding.

Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY	Domain Testable	Composite Meaningful Store	Selection age Repetition	Device Inconsistenci	<u> </u>	Comments
TECHNIQUES					ab111	lesight dependent on TC Ity to estimate range. I range estimation may
Option 9.1. Engage targets using battlesight gunnery	(Y)	Not specific to technique			not b	pe correlated with real
	Heasure Required		omatic Scoring Feedback Store	Instructor ge Scoring	Element Testable	Comments
Issue fire command: GUNNER BATTLESIGHT <target>¹⁵</target>	_K,8	<u> </u>				
Depress MANUAL RANGE BATTLE SGT button	K.B.O	<u> </u>				
Estimate range to target	<u> </u>	<u>Y</u> N			<u> </u>	
If target outside of ± 200 meters of battlesight range, enter range change using MAN RNG						
B/S ADD DROP toggle switch	K,(8,0)	<u> </u>			<u> </u>	Score use of toggle switc
Check range readout in GPSE	K,(8,0)	<u>Y</u> _N			<u> </u>	No observable behavior
Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating LRF display	Domain Testable	Composite Heaningful Stora Complex Parti		Device Inconsistenci	<u></u>	Comments
Option 9.2. Engage targets given ineffective LRF	<u>(Y)</u>				ab 111 UCOFT	esight dependent on TC ty to estimate range. Trange estimation may be correlated with real
f LRF fails to function or is endered ineffective due to invironmental conditions or attlefield obscurants, TC has	Heasure Required	Element Au Represented Mode	tomatic Scoring Feedback Stora		Element Testable	
the <u>choice</u> of using one of the ollowing techniques:	<u> K(K)</u>	ув			Υ	Test whether TC initiates appropriate technique
	Domain Testable	Composite <u>Meaningful</u> Store	Selection ge Repetition	Device Inconsistenci	<u> </u>	Comments

¹⁵ Assumes decisions were made in Part 3.3. Outcome is crew responding.

 $^{^{16}}$ Appropriate behaviors are the TC commands to begin on of the alternative techniques.

Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (cont'd)

Case 9.2.B. TC indexes range							
	<u> </u>	<u> </u>					
	Heasure Required	Element Represented		itic Scoring medback Storage			Comments
Issue fire command: GUNNER <ammo> TARGET</ammo>	K,9	Y	н			Y	- 0.000
Estimate range to target					114		
Index range using MAN RNG B/S ADD/DROP toggle switch							B-Use toggle switches? O-Correct range entered?
	Doma 1n	Compos	ite	Se lect ion	Device		Comments
Case 9.2.C. GNR indexes range	Measure	Element	Automa	tic Scoring	Instructor		Comments
Estimate range to target							
Issue fire command: GUNNER	200		195			12-	Is appropriate range announced?
•••••	Doma in	Corapos		Se lect ion	Device	• • • • •	
	• • • • • • • • • • • • • • • • • • • •					1es	Comments
Case 9.2.D. GNR manually applies range							
Engage target using GAS							
(Option 9.10)							
(Option 9.10)	Doma in	Composi		Selection :	Device		
(Option 9.10)	Doma in	Composi	te		Device	les	Comments
Option 9.3. Engage targets given multiple returns from	Domain Testable	Composi	te	Selection	Device	les Battl abili range	Comments esight dependent on TC ty to estimate range. UCO estimated may not be
Option 9.3. Engage targets given	Doma in	Composi	te	Selection Repetition I	Device	Battl abili range	esight dependent on TC ty to estimate range. UCOF
option 9.3. Engage targets given multiple returns from	Domain Testable (Y)	Composi Meaningful	Storage Automa	Selection Repetition 1	Device nconsistenc	Battl abili range corre	Comments esight dependent on TC ty to estimate range. UCO/ estimated may not be lated with real world.
Option 9.3. Engage targets given multiple returns from LEF	Oomain Testable (Y) Measure Required	Composi Meaningful Element Represented	Storage Automa	Selection Repetition 1 tic Scoring edback Storage	Device nconsistenc Instructor Scoring	Battl abili range corre Element Testable	Comments esight dependent on TC ty to estimate range. UCO/ estimated may not be lated with real world.
Option 9.3. Engage targets given multiple returns from LAF	Domain Testable (Y) Heasure Required K	Compost Meaningful Element Represented	Automa Hode Fe	Selection Repetition 1 tic Scoring edback Storage	Device nconsistenc Instructor Scoring	Battl abili range corre Element Testable	Comments esight dependent on TC ty to estimate range. UCO estimated may not be lated with real world. Comments
Option 9.3. Engage targets given multiple returns from LEF Estimate range Evaluate range display If range appears incorrect, may instruct GHR to switch LEF setting from ARM LAST	Oomain Testable (Y) Measure Required K K,O	Compost Meaningful Element Represented Y	Automa Mode Fe	Selection Repetition 1 tic Scoring edback Storage	Device nconsistenc Instructor Scoring	Battl abili range corre Element Testable	Comments esight dependent on TC ty to estimate range. UCO/ estimated may not be lated with real world. Comments
Option 9.3. Engage targets given multiple returns from LEF Estimate range Evaluate range display If range appears incorrect, may instruct GHR to switch LEF setting from ARM LAST	Oomain Testable (Y) Measure Required K K,O	Compost Meaningful Element Represented Y	Automa Mode Fe	Selection Repetition 1 tic Scoring edback Storage	Device nconsistenc Instructor Scoring	Battl abili range corre Element Testable	Comments esight dependent on TC ty to estimate range. UCO estimated may not be lated with real world. Comments
Option 9.3. Engage targets given multiple returns from	(Y) Measure Required K,0	Compost Meaningful Element Represented Y Y	Automa Hode Fe	Selection Repetition 1 tic Scoring edback Storage	Device nconsistenc Instructor Scoring 0	Battl abili range corre Element Testable Y	Comments esight dependent on TC ty to estimate range. UCO estimated may not be lated with real world. Comments

 $^{^{17}\!\}text{Appropriate behaviors are the TC commands to begin one of the alternative techniques.}$

Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES	Doma in	Composi	te	Selection	Device		
(cont'd)	Testable	<u>Heaningful</u>				1es	Comments
Case 9.3.A. Gunner relases	<u> </u>		<u>.</u>		<u> </u>		
	Measure Required	Element Represented			Instructor <u>Scoring</u>		Comments
Announce RELASE	K,B	Υ	<u>#</u>		<u> </u>	<u> </u>	
	Domain Testable	Compost	te	Se lect ion	Device Inconsistenc		Comments
Case 9.3.8. TC corrects range							
Correct range using MAN RNG B/S	Measure Required	Element Represented			Instructor <u>Scoring</u>		Comments 8-Use toggle switch?
ADD/DROP toggle switch	K,8,0	Y			8,0	<u> </u>	O-Correct range entered?
If displayed range is within ± 200 m of estimated range,							
announce FIRE	K.(8.0)	<u> </u>	<u> </u>		_ <u>B</u> _	<u> </u>	
• • • • • • • • • • • • • • • • • • • •	Domain Testable	Composi Hearingful		Selection Repetition	Device Inconsistenc	les	Comments
Option 9.4. Engage targets given no range display (loss of symbology)	(Y)	•		By special		cond1 lated	are no exercises for this tion, but it can be simu- by turning symbol knob he way down
TC choose one of the following		Element Represented	Automat Mode Fee	ic Scoring	Instructor	Element	Comments Observe whether TC initiates one of the
options: 18	<u>K(K)</u>						opt lons
		Meaningful !	Storage				Comments
Case 9.4.A. Little or no time							
Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating range	<u> </u>		· 				
Case 9.4.8. Time permitting	<u> </u>					· · · · · ·	
	Heasure Required				Instructor <u>Scoring</u>		Comments
Have gunner report range from CC	P_K,(B)	<u> </u>				<u> </u>	
Evaluate range	K,0						Observable only if range judged incorrect

 $^{^{18}}$ Appropriate behaviors are the TC commands to begin one of the alternative techniques.

Activity 9. ENGAGE TARGETS USING BEGRADED GUINNERY TECHNIQUES (cont'd)	Domain Composite Selection Device Testable Heaningful Storage Repetition Inconsistencies Comments	1
Option 9.5. Engage target given cresswind sensor failure	By special No crosswind sensor exercise	failure
	Measure Element Automatic Scoring Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comme	
If computer self-test indicates crosswind sensor failure, have the gunner cancel crosswind input	K,(B) N N	incs
	Domain Composite Selection Device	
Engage target using precision gunnery (Option 4.1 or 4.2)	Testable Meaningful Storage Repetition Inconsistencies Comments Y -	
	Domain Composite Selection Device Testable Heaningful Storage Repetition Inconsistencies Comments	
Option 9.6. Engage target given cant sensor failure	By special Degraded - Instruction No cant sensor fail	ure exercises
If computer self-test indicates	Measure Element Automatic Scoring Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comme	nts
cant sensor failure, have the GMR	W /8\	
Announce DRIVER STOP	K.(8) H H H H H	
Anidance Driver Stop	K.B. Y. H. B. Y. T. Santas	
Engage target using precision gunnerystationary (Option 4.2)	Domain Composite Selection Device Festable Heaningful Storage Repetition Inconsistencies Comments Y	
	Measure Element Automatic Scoring Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comme	
Monitor GNR's cant correction	<u> </u>	
Option 9.7. Engage target given lead angle sensor failure	Domain Composite Selection Device lestable Heaningful Storage Repetition Inconsistencies Comments	1s not
	Measure Element Automatic Scoring Instructor Element	
If computer self-test indicates lead angle sensor failure, have the GNR cancel lead angle input	Required Represented Mode Feedback Storage Scoring Testable Comme K,(8) N	nts.
Announce DRIVER STOP	K,8 Y H	
	Domain Composite Selection Device	
Engage target using precision gunnerystationary (Option 4.2)	Testable Heaningful Storage Repetition Inconsistencies Comments Y -	
Comments of the state of the st	Measure Element Automatic Scoring Instructor Element Required Represented Mode Feedback Storage Scoring Testable Comme	nts
Monitor GNR's lead	K Y N	

Activity 9.	ENGAGE TANGETS USING BEGRADED GUIMERY TECHNIQUES (cont'd)	Dome in <u>Testable</u>	111000000000000000000000000000000000000	ite Storage	Selection Repetition	Device Inconsistencie	ــــ ا	Comments
Option 9.8.	Engage target given GPS failure (day channel)							S failure independent S failure
If no GPS 1s to thermal	mage, have GMR switch channel	Heasure Required K,(B)		Hode Fe	edback Stora	Instructor (stable	Comments
(Option 4.4	ets using TIS)	Domain Testable		Storage				Comments
	Engage target given GPS/TIS failure	<u> </u>						
TC choose o	and TIS fall, the ne of the following techniques:		Represented	Mode Fe	edback Store		stable	Comments Observe whether TC initiate inappropriate technique
Case 9.9.	A. <u>Use GAS with precisi</u>	Domain Testable on	Compos	ite <u>Storage</u> C	Selection Repetition	Device		Comments
(Option 9	rget using GAS gunnery .10)							
	B. Use GAS with battle-			:				
JUREAU ACTION CONTRACT	rget using battlesight Option 9.1)							
Option 9.10	. Engage target using GAS cunnery ⁰	Dome in Testable	Compos	Storage	Selection Repetition	Device Inconsistencies		Comments
	oo gemery	Heasure	Element	Automa	tic Scoring	Instructor E		Comments
Estimate rai	nge to target	<u>K</u>					H	Range 1s given
Issue fire of GUNNER CAME	command: D> <target> <range></range></target>	K,B	<u> </u>				Y	
Lay gun (si command)	multaneous with fire	K.8.0	<u> </u>	1			Υ	Observe at console
Release over	rride	K,B,0	<u> </u>	<u> </u>			Y	
Announce (1)	RE	K,B		H			Υ	

 $^{^{19}\!\}mathrm{Appropriate}$ behaviors are the TC commands to begin one of the alternative techniques.

 $^{^{20}\!\}text{Assumes}$ decision to use GAS was made in Part 3.3. Outcome is crew responding.

Activity 9. EMGAGE TANGETS USING DEGRADED GUNNERY TECHNIQUES (cont'd) Option 9.11. Engage target given stabilization system failure (in emergenc mode)			ite Selection Storage Repetition Partial Limited			
Issue fire command:	Heasure Required	Element Represented	Automatic Scoring Hode Feedback Storage			Connents
GUNNER «AMMO» «TARGET» ²¹	K,\$	<u> </u>			<u> </u>	
Announce DRIVER STOP	K,B	<u> </u>	<u> </u>		Υ	
Lay gun (simultaneous with fire command)	K,8,0	у	<u> </u>		Υ	Score at console
Release override	K,8,0	<u> </u>		<u> </u>		
Announce FIRE	K,B	Y	<u> </u>			
Announce DRIVER, MOVE OUT	<u>K.B</u>	<u> </u>	1	<u> </u>		
Option 9.12. Engage target given turret power failure	Dome in Testable	Composition (Complex	Storage Repetition I	Device Inconsistenci	<u> </u>	Comments
	Required	Element Represented	Automatic Scoring <u>Hode Feedback Storage</u>			Comments
Announce DRIVER STOP	K, 8	<u> </u>			Y	
Issue fire command: GUNNER <ammo> <targe]> <direction> <range>²²</range></direction></targe]></ammo>	<u>K,8</u>	<u>Y</u>		. ,	Υ	
Announce FIRE	<u>K,B</u>	<u> </u>	<u> </u>	<u> </u>	Υ	
Announce DRIVER MOVE OUT	K.8	Υ		<u> </u>	Υ	

 $^{^{21}\!\}mathrm{Assumes}$ decisions made in Part 3.3. Outcome is crew responding.

 $^{^{22}}$ Assumes decisions made in Part 3.3. Outcome is crew responding.

Activity 10. ENGAGE TANGETS FROM	Domain Testable			Selection Resetition	Device Inconsistent	iles	Comments
THE TC POSITION (Also Three Man Crew Engagements)	<u> </u>						
Issue one of the following fire commends:						15.6.	
Case 10.A. <u>Gunner cannot 1dent1f</u> target	Domain Testable	Compos <u>Meaningful</u>	ite	Selection	Device		Conments
	Measure Required				Instructor		Comments
FROM MY POSITION	<u>K,8</u>	<u> </u>	Time _	Time S			Fed in by I/O
Case 10.8. Three-man crew (no GNR)	Domein Testable	Compos	ite <u>Storage</u>	Selection Repetition	Device		Comments
	Heasure	Element	Automa	tic Scoring	Instructor		Comments
LOAD <anno></anno>	<u>K,0</u>	<u> </u>					
Estimate range to target							
Sight through GPSE	K,8,0	<u> </u>				<u> </u>	Judge sight picture at
Lay on center mass of target ²³	8,(0)	Y	0 8	eplay S		<u> </u>	console
Depress lase button ²⁴	8,(0)	Υ	0 8	eplay S		<u> </u>	Judge return et console
Evaluate range display	K,0	Degraded	4				Observable only if range judged incorrect
Make control lay ¹	8,(0)	<u> </u>	0 8	eplay 5		<u> </u>	Judge sight picture at console
Announce ON THE WAY	K,B	<u> </u>	1	Time S		<u>Y</u>	Fed in by I/O
Squeeze trigger ²⁵	8,(0)		0 R	eplay 5	0		Judge sight picture at console
Announce CEASE FIRE	K,(8)		0			Y	

9. 5.00

²³ Sight picture is the relevant outcome.

²⁴Relevant outcomes are sight picture and correct range.

²⁵Relevant outcome is sight picture at the time of firing.

Activity 11. ASSESS RESULTS	Domain Testable	Composite Sel Heaningful Storage Rep	ection Device etition Inconsistenci	es C	omments
OF ENGAGEHENT	Degraded	<u> </u>	<u>. </u>		· · · · · · · · · · · · · · · · · · ·
Assess battle damage/ casualties		Element Automatic Represented Mode Feedba		Testable Co	1 m-y-1 () 1 m
Determine if and how crew should be reorganized to fight in a three-man configuration					
Issue SPOTREP	KAB	<u> </u>	 :		
Case 11.A. Tank is stationary	Domain Testable	Meaningful Storage Rep	ection Device etition <u>Inconsistenci</u>	es Co	oments
Determine whether to move	Heasure		Scoring Instructor		Comments
to primary, alternate, or supplementary firing positions	K(K)				
Issue driver commands	K,B				
Case 11.8. Tank 1s moving	Domain Testable		ection Device	esCo	mments
Determine changes to route		Element Automatic Represented Hode Feedba		Testable	
Issue driver commands	K.8		 :		
Determine appropriate ammo for enticipated targets	<u> </u>	<u> </u>			
Announce PREPARE BATTLECARRY <ammo> or RELOAD <ammo></ammo></ammo>	<u>K, (B)</u>	<u> </u>		Υ	
Enter battlecarry range using the MANUAL BATTLE SGT ADD/DROP toggle switch	K,8,0	. у		<u> </u>	

APPENDIX I - 7 TESTING CAPABILITIES OF SIMNET ON TANK COMMANDER ACTIVITIES

Activity 1. PREPARE STATIONS	Domain Testable Mea	Composite ¹ ningful Storage	Selection Repetition	Device Inconsistencie	<u> </u>	Comments
FOR OPERATION					Too me	ny missing elements
			itic Recording ² edback <u>Storage</u>			Comments
Enter station	K,8,0				H	
Power up CWS/turret	K,B,0	<u> </u>		. — .		
Operate domelight	K,8,0	(Y)				
Operate intercom	K,8,0	(Y)				
Adjust seat	K,8,0				<u> </u>	
Adjust hatch	K.8.0	<u> </u>			N_	
Adjust platform	K.B.O	<u> </u>			<u> </u>	
Install TC's weapon	K,8,0				N	
Adjust kneeguard	K,B,0				<u> </u>	
Adjust GPSE headrest/lens	K,B,0	<u> </u>			<u>H</u>	
Check manual range controls .	K,8,0	Υ				
Check power control handle	K,B,0	Υ			Υ	
Check CWS in power/menual modes	K,8,0 Pow	er only			Υ	

 $^{^{1}}$ SIMMET provides no composite scores, therefore these two columns are left blank for the entire domain.

²SIMMET has no automatic scoring capabilities. However, there is a real-time remote plan-down display with memory capture for replay. Therefore, possibilities for an instructor scoring from the plan-down display are described.

 $^{^3}$ In this column, possibilities for an instructor scoring from inside the SIMNET crew compartment are described.

Activity 2. PERFORM PREPARE- TO-FIRE CHECKS	Domain Testable Partial	Compos <u>Meaningful</u>		Succession		103	Comments
13 7 1 1 2 1 2 1 2 1	Heasure Required	Element	Automatic Mode Feedb		Instructor Scoring		Comments
Supervise/essist boresight	K,840				- -		
Boresight TC's weapon	K&B, (0)				. —		
Zero TC's weapon	K&B, (0)						
Select/announce battlecarry AHHO, RANGE	<u>K,(8)</u>		<u>.H.</u>			Y	
	Domain Testable	Compos Meaningful		lection petition I	Device Inconsistenci	les	Comments
Option 2.1. Prepare for offense	Part (a)						··
Receive offensive mission/	Measure Required	Element Represented		Scoring ack Storage	Instructor Scoring	Element Testable	Comments
formation/movement/commo	<u> </u>	<u> </u>	<u> </u>			N	No observable behavior
Analyze terrain	K(K)	Degraded					No observable behavior
Check map overlay	K(K)	Y	<u> </u>				No observable behavior
Brief crew	K,8,0	<u> </u>				<u> </u>	
Control driver, if necessary to maintain position in plt formation and to							
exploit cover and concealment	<u>K,(B)</u>	<u> </u>				<u> </u>	
	Domain Testable	Composi Meaningful		lection petition I	Device nconsistenci	<u></u>	Comments
Option 2.2. Prepare for defense	<u>Partial</u>						
Issue driver commands to move with	Measure Required	Element Represented	Automatic Hode Feedba	Scoring ack Storage	Instructor Scoring	Element Testable	Comments
platoon to occupy battle position	K, (B)	<u> </u>			8,0	<u> Y</u>	
Receive defensive mission/ position commo	<u>K</u>	<u> </u>			· ·		No observable behavior
Prepare primary/alternate/ supplementary positions	<u>K,(B)</u>	<u> </u>				×	
Analyze terrain	<u>K(K)</u>	<u> </u>				<u> </u>	No observable behavior
Prepare tank sketch card	K, (8,0)	<u> </u>			0	Y	

⁴Movement per se is primarily under driver's control. TC initiates movement and gives corrections.

Activity 3. ACQUIRE TARGET(S)			<u>Storage</u>	-	Device Inconsistencies	Missing elements and degraded
Part 3.1 Search for Target(s)						
Option 3.1.1. Search open batch - day						Open hatch not simulated
	Doma in	Compos 1	te	Selection		Comments
Option 3.1.2. Search closed batch - day						
	Required	Element Represented			Instructor El ge <u>Scoring</u> Tes	
Search 360 ⁰	K,8,0	Degraded				Y Must traverse to search
Perform air guard duties	<u> </u>	<u> </u>				N No air targets
Execute search techniques	<u> </u>	<u> </u>				No observable behavior
	Domain Testable	Compost Meaningful		Selection Repetition	Device Inconsistencies	Comments
Option 3.1.3. Search at night						Hight not simulated
	Heasure Required	Element Represented		tic Scoring		ement table Comments
Search 360 ⁰	K.8.0					
Use off-center vision	K					

Activity 3. ACQUIRE TARGET(S) (cont'd) Part 3.2. Detact/Locate/Identify	a modernia.	Compos Meaningful		Selection Repetition	Device Inconsistence		Comments
Target(s)	<u> </u>						lation may reduce validity
	Required	Element Represented	5000 1 0000	tic Scoring edback Store	Instructor ge <u>Scoring</u>	Testable	Comments
Detect target(s)/signature(s)/ obstacle(s) ⁵	<u>K(K)</u>	Degraded	<u> </u>				No observable behavior
Locate target(s)	<u>K(K)</u>	Y					No observable behavior
Identify target(s) by							
* Homenclature	<u>K(K)</u>	Degraded					No observable behavior
Note number of target	<u>K,0</u>	<u> </u>	<u> </u>			<u> </u>	No observable behavior
Classify multiple targets as most dangerous/dangerous/							
least dangerous ⁶	K,(0)		<u>n</u>				Evaluate fire command
Confirm acquisition report	K,(8,0)	<u> </u>	<u> </u>				No observable behavior
Estimate range to select weapon(s) and to evaluate LRF return	<u> </u>	Degraded					Evaluate fire command
••••••	Dome in	Compos		Selection Resettion	Dev 1ce		
Pert 3.3. Evaluate situation	YY	THE STATE OF THE S	Jeorage	MAPACIC ION	Incons 13 cenc	183	Comments
Pert 3.3. Eveluate Situation		1017-274	40,400,000	The Progression	•====	rancembe	
ACMINA DO MARCO	Required	Element Represented		tic Scoring edback Stores	Instructor <u>Scoring</u>		Comments
Decide whether or not to engage contingent on:							
' Pit mission ' Platoon fire plan ' Pit ldr command	_ K,(0)	Y				Y	Simulation may reduce validity
Select the appropriate weapon/ amounition and the firing mode (precision/degraded) contingent on: 'Target range							
 Type of target (hard/soft, point/area) Tank status (ammo, malfunctions) 	K,(0)	Y	<u></u>			<u> </u>	Evaluate fire command; not all allowable response possible on SIMMET
Determine crewman (GMR, TC, LDR) and the type of fire							
command (single, multiple, or simultaneous) contingent on: Number of targets							Evaluate fire command; not

 $^{^{5}}$ There are enough different patterns of cues to look for that detection is more complex than simple observation.

⁶Outcome is sequence of target engagement selected by TC.

Oucome is initiation of fire command.

^{*}Outcome is ammunition annouced in fire command.

Outcome is alert element of fire command.

Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistenc	Exce	Comments of TIS which primarily its gunner
Option 4.1. Engage single target from the offense usin precision gunnery	. .						
	Heasure Required	Element Represented	U 05.5 (DEU.)	tic Scoring medback Storage	Instructor Scoring	Element Testable	Comments
Issue contact report: CONTACT <direction> <target></target></direction>	K,B	Υ		10		Υ	
Decide whether to engage target while moving or from a short halt	K(K)_	<u> </u>				(Y)	No degraded mode on SIMMET so this option may never be taken
If engaging from a short helt, issue driver command: DRIVER STOP	K 8					/ Y \	No degraded mode on SIMNET so this option may never be taken
Relay any action drill command	K,8,0	'				<u> </u>	De Ceken
Issue fire command: GUNNER <ammo> <target>10</target></ammo>	K.(B)						
Lay gun (simultaneous with fire commend)	K,B,0					Y	
Release override	K,8,0	<u> </u>				<u> </u>	\
Sight through GPSE	K,8,0	<u> </u>				<u> </u>	
Evaluate range display 11	K,0	<u> </u>	1_			<u> Y</u>	
Listen for UP ¹⁷	K	Υ			8	<u> </u>	
Announce FIRE, or FIRE, FIRE <alternate ammo=""></alternate>	K,8	<u> </u>				<u> </u>	
Option 4.2. Engage single target from the defense using procision gunnery		Compost	te	Selection Repetition	Device		
угостатом учинегу	Measure	Element Represented		tic Scoring	Instructor Scoring		Comments
Issue contact report: CONTACT <direction> <target></target></direction>	K,8	<u> </u>	<u> </u>			<u> </u>	
Issue fire command: GUNNER <ammo> <target>13</target></ammo>	K,(B)	<u> </u>				<u> Y</u>	
Announce DRIVER MOVE OUT, GUNNER TAKE OVER	K,8	<u> </u>	<u></u>			<u> </u>	
Lay gum (simultaneous with fire command)	K,B,0	Υ				<u> Y</u>	
Release override	K,8,0	<u> </u>				<u> </u>	

 $^{^{10}\!\}text{Assumes}$ decisions were made in Part 3.3. Outcome is crew responding. May use reduced command.

 $^{^{11}}$ If range appears incorrect, observable outcomes are indexing range or commanding gunner to relaxe.

¹² Outcome is announcing FIRE only after hearing up.

 $^{^{13}\!}$ Assumes decisions were made in Part 3.3. Outcome is crew responding. Hay use reduced command.

	ENGAGE SINGLE TARGETS WITH THE MAIN GUN (cont'd)	Heasure Required	Element Represented	Automatic Scoring Hode Feedback Storage			Comments
ight through	n GPSE	K,B,0	Υ			<u> </u>	
Evaluate ran	ge display	K,0	<u> </u>	<u> </u>	<u> </u>	Υ	
listen for U		K,0	<u> </u>	<u> </u>		Υ	
<pre>ALTERNATE Option 4.3. (</pre>	Sunner cannot identify	Domain Testable	Composit Meaningful S	Selection Storage Repetition Inc	Device consistencie	<u> </u>	W
		. <u> </u>					
Case 4.3.A.	: Gunner fails to identify target(s)	<u> </u>					
one of the 'Yerbal co	ner onto target using following techniques: pamand: TRAYERSE RIGHT>, STEADY, ON		Represented	Automatic Scoring Hode Feedback Storage N	Scoring 1	estable _	All residents and the second
* Announce and use .	MATCH MY TRACERS .50 caliber tracers to target	Doma 1n	Composit	e Selection	Device		
and proceed	ROM MY POSITION I with TC (see Activity 10)			torage Repetition Inc	ALL PRIME IN PLAN		
	Gunner identifies incorrect target(s)						
14 CMD 40 4		Heasure Required		Automatic Scoring I Mode Feedback Storage			Comments
	to the fire command	K,(B,0)	<u> </u>	<u> </u>		Υ	
target, tre	ntifies the wrong nat as Case 4.3.A.	Testable	<u> Meaningful</u> <u>S</u>	e Selection torage Repetition Inc	onsistencie		32
	Engage target using	Doma in	Composit		Device		
	TIS	<u> </u>				No TIS	

Engage targets using precision gunnery (Option 4.1 or 4.2) 14

 $^{^{14}}$ When element references another part of the domain, classifications for referenced section apply.

	Domain Testable			Selection Repetition	Device Inconsistenc	ias	Comments
Activity 5. ADJUST FIRE	<u> </u>						
	Measure Required	Element Represented		ntic Scoring medback Storag			Comments
Recover sight picture	K,8	<u> </u>					
Observe strike of round	<u> </u>	<u> </u>	<u> </u>			<u>N</u>	No observable behavior
If TARGET was observed, determine whether or not target was destroyed	K(K)	Degraded	<u>N:</u>		<u> </u>		SIMMET uses coded graphics
	Domain Testable			Selection Repetition		les	Comments
Option 5.1. Use reengage techniqu	• <u>Y</u>						
	Measure Required			tic Scoring medback Storag			Comments
Evaluate range display	K,0	<u> </u>	<u> </u>			Υ	
Announce FIRE	K,8	<u> </u>	<u> </u>			<u> </u>	
Option 5.2. Use standard adjustme					• • • • • •	· • • • •	
	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistence	les	Comments
Option 5.3. Use TC adjustment	Y						
Issue subsequent fire command	Heasure Required			tic Scoring <u>edback Storag</u>			Comments
to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	KAB	. 	N .			Υ	
If target is destroyed or exposure too long, commend CEASE FIRE	<u>K,(B)</u>	<u> </u>				<u> </u>	
If in defensive posture, command DRIVER, BACK UP	K,(K,0)	Y				Y	

	Dome in Testable	Composite Meaningful Storage	Selection Repetition	Device Inconsistencies	Comments
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX					No coax simulation
***************************************		************************		+14 <i>4</i> +15 +16 +16 +16 +16 +16 +16 +16 +16 +16 +16	***************************************
	Dome 1n	Composite	Se lection	Device	
Activity 7. ENGAGE HULTIPLE	Testable	Meaningful Storage	Repetition	Inconsistencies	Comments
TARGETS WITH	Y				
	Heasure	10-1-11		Instructor El	
Issue fire command:	Required				table Comments
GUNNER <appo> <number> <targets>, <right left=""></right></targets></number></appo>					
<target> FIRST</target>	K,8	<u> </u>			<u>Y</u>
	Domain Testable	Composite Meaningful Storage	Selection Repetition		Comments
Engage first target using precision gunnery (Option 4.1					
or 4.2)	<u> </u>				
If first target is not destroyed, adjust fire (Activity 5)	<u> </u>				
	Heasure Regulared			Instructor El	ement table <u>Comments</u>
If first target is destroyed, announce <mext> TARGET</mext>		Y N			Y
[Continue until all targets				_ 	<u></u>
are destroyed]					
Announce CEASE FIRE	K,(8)	<u> </u>			<u>Y</u>
***************************************					***************************************
	Doma in	Composite	Se lect ion	Device	
Activity 8. ENGAGE TARGETS		Heaningful Storage			
WITH THE CAL .50 (INCLUDING SIMUL-					
TANEOUS MAIN GUN ENGAGNENTS)	н				No cal .50 simulation

Activity 9. EMGAGE TARGETS USING	Domein Testable	Compos <u>Heaningful</u>		Selection Repetition	Device Inconsistenc	<u> </u>	Comments
DEGRADED GUNNERY TECHNIQUES							
Option 9.1. Engage targets using						ab 11 SIMN	lesight dependent of TC ity to estimate range. ET range estimation may be correlated with real
bettlesight gunnery	_(<u>y</u>)					worl	<u> </u>
	Measure Regulred	Element Represented		itic Scoring edback Storag	Instructor	Element Testable	
Issue fire command: GUNNER BATTLESIGHT <target>15</target>	K, B	Y		THE STORY			Commence
Depress MANUAL RANGE BATTLE SGT button	K.8.0	<u> </u>	<u> </u>			ΥΥ	
Estimate range to target	<u> </u>	Degraded	<u> </u>			<u> </u>	·
If target outside of ± 200 meters of battlesight range, enter range change using MAN RNG 8/5 ADD DROP togale switch	_K,(B,0)	٧			•	٧	Score use of toggle switch
Check range readout in GPSE	K, (8,0)						No observable behavior
SHOOK PANGE PROGRAMME	Dome in	Compos		Se lect ion	Dev Ice		NO ODSELVEDIE DENEVIOL
					Inconsistenc	1es	Comments
Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating LRF display							
Option 9.2. Engage targets given ineffective LRF						Not	s'mulated
	18.15						
	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistenc	ies	Comments
						Batt	lesight dependent of TC
Option 9.3. Engage targets given							ity to estimate range. ET range estimation may
multiple returns from						not	be correlated with real
LRF	_(Y)_				222222222222	worl	<u> </u>
	Required	Element Represented		tic Scoring edback Storag	Instructor <u>Scoring</u>	Element Testable	Comments
Estimate range	<u> </u>	Degraded	<u> </u>				No observable behavior
Evaluate range display	<u> K,0</u>		<u> </u>			<u> </u>	
If range appears incorrect, may instruct GNR to switch LRF setting from ARM LAST RTM to ARM IST RTM							
er v.v.	K,(B,0)	Υ	<u> </u>			<u> </u>	
If multiple return symbol appears in GPSE and displayed range is out 200 m of estimated range, <u>choose</u>	•						
one of the following actions:10	<u>K(K)</u>		<u> </u>			<u> </u>	

¹⁵ Assumes decisions were made in Part 3.3. Outcome is crew responding.

 $^{^{16}\!\}mathrm{Appropriate}$ behaviors are the TC commands to begin one of the alternative techniques.

Activity 9.	ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (cont'd)	Domain Testable	•	ite <u>Storage</u>		Device Inconsistenci	<u></u>	Comments
Case 9.3.	A. <u>Cunner relases</u>	<u> </u>						
		Heasure Required	•	111000000		Instructor ge Scoring		Comments
Announce		_K,8	<u> </u>	<u> </u>			Y	
		Doma in	Compos	ite	Se lect ion	Device		Comments
Case 9.3.	8. TC corrects range							
Correct r	ange using HAN RNG B/S	Heasure Required				Instructor ge Scoring		Comments
ADD/DROP	toggle switch	K,8,0	Y	<u> </u>			Y	
± 200 m o	yed range is within f estimated range, FIRE	K, (8.0)	<u> </u>	. <u>H</u>			Υ	
• • • • •	• • • • • • • • • • • • • • • • • • • •	Doma in			Selection	Device	• • • • •	
						Inconsistenci	• \$	Comments
	Engage targets given ne range display (less of symbology)							mu lated
	• • • • • • • • • • • • • • • • • • • •	Doma in			Selection			
							2.5	Comments
Option 9.5.	Engage target given crosswind sensor failure							mu lated
• • • • •	• • • • • • • • • •							••••••
		Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistencia	25	Comments
	Engage target given				-			
	cant sensor failure						Not s1	mulated
.,	• • • • • • • • • • • •	Doma in	Composi		Se lection	Device		
		<u>Testable</u>					<u> </u>	Comments
	Engage target given laid angle sensor failure			-			Not s1	mu lated
	• • • • • • • • • • • • • • • • • • • •					• • • • • •	•	
Option 9.8.	Engage target given GPS failure	Domain Testable	Composi Meaningful		Selection Repetition	Device Inconsistencie	<u>. </u>	Comments
	(day channel)						Not s1	mulated
• • • • • •	• • • • • • • • • • • • • • • • • • • •					• • • • • • •		
		Domain Testable	Composi Meaningful		Selection Repetition	Device Inconsistencia	15	Comments
Option 9.9.	Engage target given							
	GPS/TIS failure			—			MOE \$1	mu lated

Testing Capabilities of SIMMET on Tank Commander Activities

Activity 9.	ENGAGE TARGETS USING BEGRADED GUNNERY TECHNIQUES						
	(cont'd)	Dome 1n	Composi	te	Selection	Dev 1ce	
		Testable	Heaningful	Storage	Repetition	Inconsistencies	Comments
Option 9.10	. Engage target using	4-2-72		4.71			
	GAS gunnery17						Not simulated
• • • • • •	• • • • • • • • • • • • • • • • • • • •	• • • • •	• • • • • • •	• • • •	• • • • • •	•••••	
		Doma in	Composi	te	Selection	Dev 1ce	
		Testable	Meaningful	Storage	Repet 1t ion	Inconsistencies	Comments
Option 9.11	 Engage target given stabilization system failure (in emergency 						
	mode)			 -	 -		Not simulated
		Doma 1 n	Compos 1	te	Selection	Dev1ce	
		Testable	and the second s			Inconsistencies	Comments
Option 9.12	. Engage target given		1000	7.2.4			
JAMES SELL STREET	turret power failure						Not simulated

 $^{^{17}\!\}text{Assumes}$ decision to use GAS was made in Part 3.3. Outcome is crew responding.

Activity 10. ENGAGE TARGETS FROM	Domain Testable	Composi Heaningful		Selection Repetition	Device Inconsistence	les	Comments
THE TC POSITION (Also Three Man Crew Engagements)	<u> </u>						king skills are assessed by target hit
Issue one of the following fire commends:							
Case 10.A. <u>Gunner cannot identify</u>	Domain Testable	Compost	te	Se lect ion	Dev Ice	les	Comments
target	Heasure Required				Instructor Scoring		Comments
FROM MY POSITION	K,B	<u> </u>	<u></u> _			<u> </u>	
Case 10.8. Three-man crew	Dome in	Compost Meaningful	te	Selection	Dev ice		Comments
100 100	Measure	Element			Instructor se Scoring		Counents
LOAD «AMO»	<u>K,8</u>	<u> </u>				Ÿ	
Set/check switches: ' FIRE CONTROL MODE: HORMAL ' TIS: STBY/ON ' LRF: ARM LAST RTN ' GPS: 3X ' GUN SELECT: MAIN ' AMMO SELECT as selected							
Estimate range to target	<u> </u>	Degraded	<u> </u>			<u> </u>	
51ght through GPSE	K,8,0	<u> </u>	<u></u>			Υ	Not observable by
Lay on center mass of target 18	8,(0)	<u> </u>	<u></u> _			Υ.	Instructor in compartment
Depress lase button ¹⁹	8,(0)	<u> </u>	<u> </u>			<u> </u>	Not observable by
Evaluate range display	K,0						Instructor in compartment Not observable by
Make control lay ¹	8,(0)	<u> </u>					instructor in compartment
Announce ON THE WAY	K,8	<u> </u>	<u> </u>			Υ	
Squeeze trigger ²⁰							
Announce CEASE FIRE	K, (B)	<u> </u>	<u>. N</u>			Ÿ	

¹⁸ Sight picture is the relevant outcome.

 $^{^{19}\}mathrm{Re\,levant}$ outcomes are sight picture and correct range.

 $^{^{20}\}mbox{Relevant}$ outcome is sight picture at the time of firing.

Testing Capabilities of SIMMET on Tank Commender Activities

Done in <u>Testable</u>			Selection Repetition	Device Inconsistent	iles	Comments
<u> </u>						
	Represented	<u>Hode</u> fe	edback Store	scoring	Testable	
K(K)						
<u> </u>						
KAB	<u> </u>					
Doma In	Composi	Ite	Selection	Dev Ice		Comments
						
Heasure Required	Element Represented					Connents
K(K)	<u> </u>				<u> </u>	No observable behavior
<u>K,B</u>	<u> </u>			- —	<u> </u>	
Doma in	Compos 1	te	Se lect ion	Dev1ce		
Heasure Required						Comments
K(K)	<u> </u>				_ <u>#</u>	No observable behavior
K,B	<u> </u>					
		• • • •		• • • • • •	• • • • •	
K(K)	<u> </u>				<u> </u>	
<u>K.(8)</u>	<u> </u>				<u> </u>	
K,B.0	Y				Y	
	Testable Y Heasure Required K(K) K KAB Domain Testable Heasure Required K(K) K,B Domain Testable K(K) K,B K(K) K(K) K(K) K(K)	Tostable Meaningful Y Measure Element Required Represented K(K) M KAB Y Domain Composit Testable Meaningful Measure Represented K(K) Y K,B Y Domain Composit Testable Meaningful Measure Represented K(K) Y K,B Y Meaningful Measure Represented K(K) Y K,B Y K(K) Y K,B Y	Testable Meaningful Storage Y Measure Element Automate Required Represented Mode Fetable K(K) M KAB Y Domain Composite Testable Meaningful Storage Measure Element Automate Required Represented Mode Fetable Meaningful Storage Measure Element Automate Required Represented Mode Fetable Meaningful Storage Measure Element Automate Required Represented Mode Fetable Mode FetaBle Mode Fetable Mode Fetable Mode FetaBle	Tostable Meaningful Storage Repetition Y Measure Element Automatic Scoring Required Represented Mode Feedback Storage K(K) K K K K K K K K K K K K	Testable Meaningful Storage Repetition Inconsistent Y Heasure Element Automatic Scoring Instructor Required Represented Mode Feedback Storage Scoring K(K) N KAB Y Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistent Required Represented Mode Feedback Storage Scoring K(K) Y K,B Y B Domain Composite Selection Device Testable Meaningful Storage Repetition Inconsistent Mode Feedback Storage Scoring K(K) Y K,B Y B Composite Selection Device Testable Meaningful Storage Repetition Inconsistent Mode Feedback Storage Scoring K(K) Y K,B Y B K(K) B	Tostable Meaningful Storage Repetition Inconsistencies

APPENDIX I - 8 TESTING CAPABILITIES OF SIMMET ON LOADER ACTIVITIES

Activity 1. PREPARE STATIONS FOR OPERATION		site ¹ Selection Device Storage Repetition Inconsistencies	Comments
134 5 257 34	Measure Element	Automatic Recording Instructor Element Mode Feedback Storage Scoring Testabl	nt • Comments
Erect crosswind sensor	K.B.O N		
Install LDR's machinegun	K,8,0 N	<u>_</u>	
Enter LDR's station	K.B.O N		·· ··
Operate domelight	K,B,0 (Y)		
Power up LDR's station	K,8,0 N		
Operate intercom	K.B.O (Y)	<u> </u>	•
Adjust LDR's seat/platform	K,8,0 N		
Adjust LDR's hatch	K,8,0 N		
Install/check LDR's might vision viewer	K,B,O N		-
Position LDR's guards for firing	K,B,O N		
Operate LDR's panel	<u>K,8,0</u> N	- <u> </u>	·
Operate turret traverse lock	K,8,0 N		
Operate ready ammunition door in auto/menual modes	K,8,0 N		
Operate semi-ready emmunition door	<u>K,8,0</u> <u>N</u>		
Operate hull amounition door	K,B,0 N	- — — — —	
Stow 105mm amounttion	K,8,0 N		
Operate main gun breechblock	K,8,0 N		
Check replenisher	K,8,0 N		

¹SIMMET provides no composite scores, therefore these two columns are left blank for the entire domain.

²SIRMET has no automatic scoring capabilities. However, there is a real-time remote plan-down display with memory capture for replay. Therefore, possibilities for an instructor scoring from the plan-down display are described.

³In this column, possibilities for an instructor scoring from inside the SIMMET crew compartment are described.

Activity 2. PERFORM PREPARE- TO-FIRE CHECKS	Domain Testable	Composit Meaningful		election epetition	Device Inconsistenc	105	Comments
	Heasure Required	Element Represented		c Scoring back Storag	Instructor e Scoring		Comments
Clear/load coaxial machinegum	K,B,0	<u> </u>	<u> </u>				
F111 ready rack	K,B,0		<u>+ _ </u>				
Report ammo status	K,B	<u> </u>	<u> </u>			<u> </u>	Listen for report
Load battlecarry ammo	K,8,0	Konly	<u> </u>				See footnote Option 4.1
Option 2.1. Prepare for offense	Dome in Testable	Composit Meaningful S		election epetition	Device Inconsistenc	les	Comments
	Measure Required	Element Represented		c Scoring back Storage	Instructor Scoring	Element Testable	Comments
Receive TC briefing	<u>K</u>	<u> </u>	<u>N</u>		- —		No observable behavior
Option 2.2. Prepare for defense	Domain Testable	Composit Meaningful S	torage Re		Device Inconsistenci	les	Comments
	Heasure Required	Element Represented		c Scoring back Storage	Instructor Scoring	Element Testable	Comments Observable behavior is when the loader looks;
Inspect terrain to flank/rear	<u> K(K)</u>					<u>(Y)</u>	cannot judge inspection

	Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistencie	<u> </u>	Co.ments
Activity 3. ACQUIRE TARGET(S)	_ 1					Missi	ing and degraded elements
Part 3.1. Search for Target(s)							
Option 3.1.1. Search open hatch - day						No op	en hatch simulation
Option 3.1.2. Search closed hatch - day							
Search right front counter- clockwise to right rear		Represented	Mode Fe	edback Store	Instructor ge Scoring To	estable	Can observe whether loader looks is require area
Execute search techniques	<u> </u>		<u> </u>			N	No observable behavior
Option 3.1.3. Search at night	Doma 1n	<u>Heaningful</u>	Storage	Selection Repetition	Device Inconsistencie	<u> </u>	Comments Ont simulation
Part 3.2. Detect/Lecate/ Identify Target(s)		Compos Meaningful	Storage	Selection Repetition	Device Inconsistencies	<u> </u>	Comments ation may reduce validity
	Measure	Element	Automa	tic Scoring	Instructor	lement	Comments
Detect target(s)/signature(s)/ obstacle(s)	K.(K)	Degraded				N	No observable behavior
Locate target(s)	K, (K)	<u> </u>	<u> </u>			N	No observable behavior
Identify target(s) making the following determinations: 'IFFN							
nomenclature	<u>K,(K)</u>	Degraded	<u>N</u>			Υ	No observable behavior
If target detected, announce LOADER REPORT (TARGET) (LOCATION)	K,8	<u> </u>	<u>N</u>			γ	Listen for report

Part 3.3. Evaluate Situation

No ! DR actions specified

		Domain Testable	Compos Meaningful	77500	Selection Repetition	Device Inconsistenc	103	Comments
Activity 4.	ENGAGE SINGLE TARGETS WITH THE MAIN GUN						See	footnote
Option 4.1.	Engage single target from the offense usin precision gunnery) <u>II</u>					See 1	footnote
		Heasure Required	Element Represented	100	tic Scoring edback Storage	Instructor Scoring		
Drop down 1s	to turret	K,8,0						
Check turret	ring	8,0						
Set GUN/TURR in EL UNCPL	RET DRIVE switch position	K.B.O	<u> </u>	<u> </u>			<u> </u>	.
	A. Announced round 1s not loaded	• • • • •		• • • •				
Move eject	ion guard to SAFE	K,8,0	<u>k</u> 4			<u> </u>		
Ensure SAF	E light is lit	K,8,0	<u> </u>	1				
Open breed	h	K,B,0	K				18	
	orrect round from	K.(8.0)	K					
Open ammo	doors	K,8,0	<u> </u>			- —		
Stow unwen	ited round, 1f	K,0,0	<u> </u>					
Remove cor stowage	rect round from	K,8,0	<u> </u>					
Load desir	ed round	K,8,0	K				- 1	
	with Case 8:}							
	. Announced round load	ed			•••••			• • • • • • • • • • • •
Move eject	ion guard to FIRE	K,B,0	K	<u>n</u>				
Clear reco	11 path	K,B,0	K					
Announce U	P	K.B.O	<u> </u>				<u> </u>	
Open ammo	doors	K,B,0	K				<u> </u>	

⁴Each of the elements marked with a "K" in this column are represented in SIMMET by a toggle switch or push button which is flipped or pressed to simulate executing the element. The "K" rating signifies that only the knowledge of the procedure is represented, not the actual behavior. Testing behavior, outcomes or time under these conditions is unwarranted. In addition, loading in SIMMET requires knowledge of how the various behaviors are represented by SIMMET, as well as knowledge of the procedure itself. Therefore testing knowledge of the loading procedure is contaminated.

Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (cont'd) Dome in Composite Se lect ion Device Testable Heaningful Storage Repetition Inconsistencies Comments Option 4.2. Engage single target from the defense using precision gunnery See footnote Element Autometic Scoring Instructor Element Heasure Required Represented Mode Feedback Storage Scoring Testable Comments K,9,0 Drop down into turret 8,0 # - --- <u>--</u> -Check turret ring Set GUN/TURRET DRIVE switch In EL UNCPL position K,B,O Y N B Y Case 4.1.A. Announced round is not loaded Move ejection guard to SAFE K,8,0 Ensure SAFE light is lit K,8,0 X Oben breech K,8,0 <u>K N ...</u> Remove Incorrect round from K,(8,0) K N chamber, 1f necessary Open aumo doors K,B,0 Stow unwanted round, 1f necessary K,B,O K N N Remove correct round from K,8,0 stowage N Load desired round K,B,0 [Continue with Case 8:] Case 4.1.8. Announced round loaded K,8,0 K Move ejection guard to FIRE K,8,0 K N Clear recoil path _ __ Announce UP K,8,0 Y N B Y K,8,0 K N N Open ammo doors

Stack of the elements marked with a "K" in this column are represented in SIMMET by a toggle switch or push button which is flipped or pressed to simulate executing the element. The "K" rating signifies that only the knowledge of the procedure is represented, not the actual behavior. Testing behavior, outcomes or time under these conditions is unwarranted. In addition, loading in SIMMET requires knowledge of how the various behaviors are represented by SIMMET, as well as knowledge of the procedure itself. Therefore testing knowledge of the loading procedure is contaminated.

TARGETS WITH THE MAIN GUN (cont'd)								
Option 4.3. GMR cannot identify	announced t	target						
to LDR actions specified								
	Dome in	Compos	ite		Device			
Option 4.4. Engage targets using TIS				Kepetition	Inconsistencies		Comments	
Perform LDR's actions as describe in precision gunnery (Option 4.1								
				Se lection		••••••	•••••••	•••••
	<u>Testable</u>	<u>Heaningful</u>	Storage	Repetition	Inconsistencies		Comments	
Activity 5. ABJUST FIRE							- .	
Set GUN/TURRET DRIVE Switch					Instructor El ge <u>Scoring</u> <u>Tes</u>	table	Comments	
In EL UNCPL position	K,8,0	<u> </u>	<u> </u>			<u>Y</u>		_
002-10040102-00052				Selection Repetition	Device Inconsistencies		Comments	
oad announced round Case A, Option 4.1)								
option 5.1. Use reengage technique	ue.							
lo LDR actions specified								
option 5.2. Use standard adjustme	ent							
o LDR ections specified								
ption 5.3. Use TC adjustment								
o LDR actions specified								

Activity 6.	ENGAGE A SINGLE TARGET WITH THE COAX	Domain Testable	Composite Meaningful Si		Selection Repetition	Device Inconsistencies	Comments No coax simulation
************					•••••••	•••••••	
Activity 7.	ENGAGE MULTIPLE	Domain Testable	Composite Meaningful St		Selection Repetition	Device Inconsistencies	Comments
TARGETS WITH THE MAIN GUN			 .		·····		
described 1	's actions as in precision ition 4.1 or 4.2)						
destroyed,	rget is not perform LDR's described in			 ,			
described i	's actions as n precision tion 4.1 or 4.2)			 .			
•••••			***************************************				
Activity 8.	ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMUL-	Dome in Testable	Composite Meaningful St		Selection Repetition	Device Inconsistencies	Comments
	TAMEDUS MAIN GUN ENGAGEMENTS)			<u> </u>	-		No coax simulation
••••••					••••••		
Activity 9.	ENGAGE TARGETS USING DEGNADED	Domain Testable	Composite Heaningful St		Se lection Repetition	Device Inconsistencies	Comments
Option 9.1	GUNNERY TECHNIQUES and 9.3	_ 					
Perform LDR described 1	's actions as						

Remaining options are not represented by SIMMET

	Doma in	Composite	Selection	Device	
Activity 10. ENGAGE TARGET FROM	<u>Testable</u>	Meaningful Store	ge Repetition	Inconsistencies	Comments
THE TO POSITION					
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)					
•••••••	******		************		
	Doma 1 n	Composite	Selection	Device	
Activity 11. ASSESS RESULTS	Testab le	Meaningful Store	ge Kepetition	Inconsistencies	Comments
OF ENGAGEMENT	N				
	Measure Required	Element Auto	omatic Scoring Feedback Store	Instructor Element Instructor Element Instructor Element Instructor Element Instructor Element	Comments
Check replenisher reservoir	K,B,0				
Remove spent casings	K,B,0			<u></u>	
	Domain Testable	Composite Meaningful Store	Selection Repetition	Device Inconsistencies	Comments
Load announced round as described in precision					
gunnery (Option 4.1 or 4.2)					
	Measure		matic Scoring	Instructor Element	90000
	Required	Represented Mode	Feedback Store	ge Scoring Testable	Comments
Announce loading status	K,B			_ <u>B</u> _ Y	

APPENDIX I - 9 TESTING CAPABILITIES OF SIMNET ON DRIVER ACTIVITIES

Activity 1. PREPARE STATIONS		mposite ¹ Selection ful Storage Repetition	Device Inconsistencies	Comments
FOR OPERATION			<u>Too</u>	many missing elements
	Heasure Eleme Required Represe		g ² Instructor Elemen ge <u>Scoring³ Testabl</u>	
Enter DYR's station	K,B,O N			
Power up hull systems	K,8,0 Degrad	ed N		-
Operate domelight	K,8,0 (Y)			
Check turret seal	K,B,O N		N	_
Operate intercom	K,8,0 (Y)			
Adjust seat/periscopes	K,8,0 N		<u></u>	
Adjust hatch	K,8,0 N		<u>N</u>	
Adjust steer/throttle control	K,B,O N		<u></u>	-
Operate drain valves	K,8,0 N		<u>N</u>	
Start engine	K,B,O N			
Make after-start checks	<u>K,B,O</u> N			

¹SIMMET provides no composite scores, therefore these two columns are left blank for the entire domain.

²SIMMET has no automatic scoring capabilities. However, there is a real-time remote plan-down display with memory capture for replay. Therefore, possibilities for an instructor scoring from the plan-down display are described.

³The driver compartment is completely enclosed with no room for an observer. Therefore, the possibilities for instructor scoring are from the remote plan-down display or observation of tank movement from another adjacent simulator. In either case, listening to radio/intercom communications is assumed.

Activity 2. PERFORM PREPARE-TO- FIRE CHECKS	Domain Testable (Y)	Compos <u>Heaningful</u>		Selection Repetition	Device Inconsistenc	Terra	Comments in simulation may reduce validity
	Measure	Element Represented			Instructor Scoring	Element	
Check fuel tanks	<u> </u>	<u> </u>					
Report fuel status	K,B	<u> </u>	<u>"</u> _			<u> </u>	Listen for report
Option 2 Prepare for offense	Domain Testable	Compos Meaningful	ite <u>Storage</u>	Selection Repetition	Device Inconsistenc	ies Terra	Comments in simulation may reduce validity
	Heasure Required	Element	Automa	tic Recording	Instructor	Element	Comments
Receive TC briefing	<u> </u>	<u> </u>	<u> </u>			<u> </u>	No observable behavior
Select routes in accordance with mission and formation	KAB, (0)	<u> </u>	_0			<u> </u>	Observe tank movement
Option 2.2. Prepare for defense	Domain Testable	<u>Meaningful</u>	ite <u>Storage</u>	Selection Repetition	Device Inconsistence	les Terra	Comments in simulation may reduce
operon 2.2. Prepare for defense	Heasure	Element Represented	Automa	tic Recording	Instructor	Element	validity Comments
Orive to battle position	K&B, (0)	ΥΥ	0		0	<u> </u>	Observe tank movement
Rehearse movement between primar and alternate firing positions		<u> </u>	0			<u> Y</u>	Observe tank movement
Take primary firing positions	K18, (0)	Y	0			<u> Y</u>	Observe tank movement
Monitor displays	K,8	<u> </u>			8	Y	Observe driver report of warnings/actions

		 -	 -		Miss	sing and degraded elements
				-	_	- 105 and defidade a langue!
		—				
		 -				ET does not simulate hetch
		<u>. </u>	7.75	0	<u> </u>	Observe tank movement
<u>_</u>		<u> </u>		. —		No air target
<u>_</u>		<u> </u>				No observable behavior
le <u>Heanin</u>	<u>oful</u> St	orage 2	election apetition	Device Inconsistence	les	Comments
					Hight	: not simulated
					Simu	lations may reduce validity
d Repres	ented M	ode Feed	Iback Storage	Scoring	<u>Testable</u>	
Degra	ded	<u> </u>				No observable behavior
Y		N		8	Y	Listen for report
_	11		1	10		W =
	n Colle Heanin e Elemed Repres Degre	n Composite Neaningful St Element ed Represented M Degraded Y Degraded	Ped Represented Mode Feed Y	Ped Represented Hode Feedback Storage Y N Y N Y N Composite Selection Heaningful Storage Aspetition Degraded N Y N Degraded N Y N N N N N N N N N N N N N	Ped Represented Mode Feedback Storage Scoring Y N O Y N Y N Y N Composite Selection Device Device Deepen Device December Device De	N

No driver actions specified

		Domain Testable	Compos Meaningful		Selection Repetition	Device Inconsistencie		Comments
Activity 4.	ENGAGE SINGLE TARGETS WITH THE MAIN GUN	Hovement only					Canno	ot observe driver's
Option 4.1.	Engage single target from the offense using precision gunnery	<u>(Y)</u>					Terra valid	in simulation may reduce
Monitor TC	and platoon leader	Measure Required	Element Represented		tic Recording edback Storage		lement stable	Comments
commends				<u> </u>			H	No observable behavior
If TC annou smoothly	nces HALT, stop	KAB,(O)	<u> </u>	<u>#</u>			Y	Observe tank movment
	not announce HALT, eady platform	KAB, (O)	<u> </u>	<u>*</u> _			Υ	Observe tank movement
seek cover	fire is encountered, and concealment action drill	KAB,(O)	Υ	<u> 2011</u>		_ 0	Y	Observe tank movement
Alert crew	of obstacles	K,B	Υ					Listen for reports
Option 4.2.	Engage single target	Domain Testable	Composi Meaningful		Selection Repetition I	Device Inconsistencies		Comments
	from the defense using precision gunnery	Hovement only					Canno behav	t observe driver's
		Measure Required	Element Represented		tic Recording edback Storage			Comments
ON position	L IDLE switch to	K,B,0	Υ					t a
Set transmi	ssion control to D	K,8,0	<u> </u>					
Release pari	king brake	K,8,0	<u> </u>					
Depress ser	vice brake	K,8,0	<u> </u>	<u> </u>				
Hove to hul	1 defilade position	K,8,0	<u>Y</u>	0				Observe tank movement
Set transmi	ssion control to R	K,B,O	<u> </u>	<u></u>				
Depress/hole	d service brake	K,B,0	<u> </u>					
Option 4.3.	GMR cannot identify an	nounced ta	rget					
He	o driver actions specif	led						
•••••		Domain Testable	Composi Meaningful		Selection Repetition I	Device nconsistencies		Comments
Option 4.4.	Engage target using TIS						No TI	s
	's actions as described n gunnery (Option 4.1 o							

Activity 5.	ADJUST FIRE	Domein Testable (Y)	Compos Meaningful	Selection Repetition	Device Inconsistencies	Comments Terrain simulation may reduce validity
Return to de alternate po	filade or seek sition	Heasure Required K&B, (0)	Element Represented Y		ng Instructor El ge Scoring Tes	
Activity 6.	ENGAGE A SINGLE TARGET WITH THE COAX	Domain Testable	Compos Meaningful	Selection Repetition	Device <u>Inconsistencies</u>	Comments Ho coax simulation
Activity 7.	ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN	Domain Testable Movement only		Selection Repetition	Device Inconsistencies	Comments Cannot observer driver's behaviors. Terrain simulation may reduce validity
	s actions as described gunnery (Option	Movement on ly		 		Simulation may reduce validity
perform DVR'	get is not destroyed, s actions as described stment (Activity 5)	Movment on ly		 		
	s actions as described gunnery (Option	Hovement only		 -		
Activity 8.	ENGAGE TARGETS WITH THE CAL50 (INCLUDING SIMIL- TAKEOUS MAIN GUN ENGAGEMENTS)	Measure Required	Element Represented		g Instructor El ge <u>Scoring</u> <u>Tes</u>	

Activity 9.	ENCAGE TARGET USING BEGRADED GUNNERY TECHNIQUES	Dome in Testable Hovement only	Compos Meaningful		Selection Repetition	Device Inconsistencies	Comments Cannot observe driver's behaviors. Terrain simulation may reduce validity
Options 9.1	and 9.3	Movement only					
	's actions as describe gunnery (Option	d :					
Remaining op	otions are not simulat	ed by SIMME	:T				
••••••		••••••		••••••	••••••	•••••••	•••••••
		Doma in	Compos	ite	Selection	Device	
		Testable	<u>Heaningful</u>	Storage	Repet 1t 1on	Inconsistencies	Connents Cannot observe driver's
Activity 10.	ENGAGE TARGET FROM	Hovement					behaviors. Terrain simulation
	THE TC POSITION	only					may reduce simulation
	s actions as describe gunnery (Option						
		••••••		••••••		•••••••••	••••••
		Dome in Testable	Compos Heaningful		Selection Repetition	Device Inconsistencies	Comments
Activity 11.	ASSESS RESULTS OF ENCAGEMENT	Hovement only					Cannot observe driver's behaviors. Terrain simulatin may reduce simulation
		Heasure Required	Element Represented			g Instructor Ele	
Respond to T	C driving commands	K&8,(0)				0	Υ

APPENDIX J

TRAINING AND TESTING OBJECTIVES FOR INSTRUCTIONAL UNITS

APPENDIX J TRAINING AND TESTING OBJECTIVES FOR INSTRUCTIONAL UNITS

Objective Number	Condition(s) Under Which Action is Performed	In W	her Units hich Actio Trained
Unit Number:	1		
Title:	Conduct of FireBasic Skills and Knowledges		
Device/Hedium:	Classroom		
3:IIc	Acquired target(s)	TC issues fire command	/16
3:111f	Target range/type & FCS status	Select weepon/ammo and firing mode (precision/degraded)	/16
3: IIIg	Number of targets & Target classification	Determine crewman and fire command (sgl, mult, or sim)	/16
4:IIId	Relation of gun tube to target	Recall appropriate verbal command to guide GMR	/9
4:1117	GNR's control handle	Recall function and operation of lase buttons	/2
4:111h	LRF display	Interpret meaning of LRF symbol(s)	/14
5:1116	GNR control handles	Recall function and operation of palm switches	/2
Unit Number:	2		
Title:	Precision Gunnery IGunner Duties		
Device/Medium:	VIGS/TopGun		
4:1	Fully operational FCS & Single main gun target	Engage target using precision gunnery techniques	/9,19
4:11d	Moving target	GNR tracks target using control handles	/9
4: I le	Reticle on target	GNR lases to target	/9
4:IIf	Return within/beyond 200m of estimated range	TC announces FIRE/GNR relases to target	/9,14
4:IIIc	GNR control handles & Target	Manipulate GNR control handles to set aiming point on target	/9
4:IIIe	Target track	Manipulate GMR's control handles to follow track	/9
4:1117	GNR's control handle	Recall function and operation of lase buttons	1/9
5:1116	GNR control handles	Recall function and operation of pelm switches	1/13
Unit Number:	3		
Title:	Secondary Functions IPREOPS Procedures		
Device/Hedium:			
1:1	Secured tank	Prepare tank crew stations for operation	
1:IIa	Turret power OFF	TC prepares commander's station for operation	
1:IIb	Turret power ON	GNR prepares gunner's station for operation	
1:IIc	Turret power ON	LDR prepares loader's station for operation	
1:114	Engine OFF	DVR prepares driver's station for operation	
1:IIIa	Task performed with aid of TM	Locate test procedure in TH	
1:1116	Task information in TH format	Answer questions concerning task	
4:IIa	Fire commend	GMR sets/checks FCS/TIS switches for precision	
4.777.	F	engagement	/9
4:1118	Engagement scenario	Identify appropriate setting for GMR station switches	
9.1:IIb	Bettlesight fire command	GNR sets switches for bettlesight engagement	/11
9.2:IVc	Computer control panel	Retrieve/store data in ballistic computer	/12
.A.2:1119	Output from computer self-test	Determine status of fire control system	/12

Objective Number	Condition(s) Under Which Action is Performed	In M	ner Units Nich Action Trained ^a
Unit Number:	4		
Title:	Secondary Functions IIPREFIRE Procedures		
Device/Hedium:	Tank/F1e1d		
2:1	PREOPS completed	Prepare tank to fire in offensive or defensive mission	
2:114	Stations prepared for operation	TC/GNR boresight weapons	
2:115	Battlecarry announcement	Prepare battlecarry posture	
2:11c	Offensive/defensive mission	Prepare for moving/stationary engagement	
2:111b	Likely threat targets/ranges	Select appropriate battlecarry ammunition and range	
2:111c	Movement technique	Recall appropriate position of tanks during movement	
2:111d	Map or view of terrain	Identify sources of cover and concealment	
2:111e	Map or view of terrain	Identify primary, alternate, and supplementary positions	
2: [[[f	Mep or view of terrain	Analyze terrain	
2:IIIg	Hap or view of terrain	Prepare sketch range card	
Unit Number:	5		
Title:	Loader Duties		
Device/Hedium:	Tank		
4:11g	Fire command & Moving/stationary tank	LDR sets switch on EL UNCPL/POMERED & loads round	/19
4:1111	LDR's control panel	Rocall function of GUN/TURRET DRIVE switch	/19
4:IIIj	APPID element of fire command	Identify round by sight	
6:11g	Fire command	LDR ensures switch is in POWERED & monitors ammo feed	
Unit Number:	6		
Unit Title:	Driver Duties		
Device/Hedium:	Tank		
2:1Vb	Operational tank & Trafficable terrain	Drive an Mi tank	
4:11h	Fire commend & Moving/stationary tank	DVR meintains steady platform/moves turret to hull-down	/19
6:11h	Fire commend & Hoving tank	OVR maintains steady platform	/19
9.6: IID	Moving tank	TC commands ORIVER STOP & DVR stops smoothly	/12
11:IIe	Orders to change route OR to move between firing positions	TC 1ssues driver command & DVR responds	/15
Unit Number:	7		
Title:	Target Acquisition/Range Determination		
Dev Ice/Hed Ium:	Field		
3:1	Detectable target(s)	Acquire target(s)	
3:IIa	Target(s) or signatures visible within sector	Detect target(s)	
3:116	Target(s) in sight	Provide acquisition report	
3:111e	Search responsibility within platoon	Identify crew search sectors	
3:111b	Search conditions	Identify appropriate search techniques	
Jillic	Target signature(s)	Identify target(s)	
3:111d	Visible target(s) & Location method	Report target location IAM given method	
3:IIIe	Visible target(s)	Identify target as friend/foe/neutral and by nomenclature	
3: IVa	Visible target	Estimate range to target	
3: IVb	Target array	Classify target as most dangerous/dangerous/	
		least dangerous	/16

Objective Number	Condition(s) Under Which Action is Performed	In Whi	r Units ch Actio rained ^a
Unit Humber:			
Title: Device/Hedium:	Precision Gunnery IITC Duties U-COFT		
4:116	Fire command	TC lays gun for direction	/9
4:111b 8:111a	TC control handle CWS controls	Operate TC control handle to control turret direction Operate CHS controls to traverse, elevate, and fire cal .50	/9 · /17
9.1:Ila	Battlesight fire command	TC presses MANUAL RNG button & adjusts w/ ADD/DROP switch	/11
	TC station controls	Recall function & operation of menual range controls	/11
10: I	GIR cannot identify target OR GIR is absent	Engage target from the tank commander position	/19
10: IIa	Four-men crew/three-man crew	TC announces FROM MY POSITION/LOAD AVMO	
10:11b	Target visible in GPSE	TC lays reticle on center of mass	
10:11c	Hoving target	TC tracks target using commander's control handle	
10:114	Reticle on target	TC lases to target	
10: Ile	Return within/beyond 200m of estimated range	TC announces ON THE WAY/TC relases to target	
10:111b	TC control handles & Target	Manipulate TC control handles to set reticle on target	
10:IIIc	Target track	Menipulate TC's control handles to follow track	
10:1114	TC's control handles	Recall function and operation of lase buttons	
Unit Humber:	•		
Title:	Precision Gunnery IIITC/Gunner Coordination		
Device/Hedium:			
4:1	Fully operational FCS & Single main gun target	Engage target using precision gunnery techniques	/19
4:Ila	Fire commend	GMR sets/checks FCS/TIS switches for precision engagement	3/
4:11b	Fire comend	TC lays gun for direction	8/
4:Ilc	Target visible/not visible in GPS or IIS	GR announces IDENTIFIED/CANNOT IDENTIFY	3.5
4:11d 4:11e	Hoving target	GIR tracks target using control handles	2/
4:11e	Reticle on target Return within/beyond 200m of estimated range	GMR lases to target TC announces FIRE/GMR relases to target	2/ 2/14
4:IIIa	Engagement scenario	Identify appropriate setting for GIR station switches	2.3/
4: IIIb	TC control handle	Operate TC control handle to control turret direction	8/
4: IIIc	GIR control handles & Target	Manipulate GMR control handles to set aiming point	
4:1114	Releation of our tube to toward	on target	2/
4:111d 4:111e	Relation of gun tube to target Target track	Recall appropriate verbal command to guide GMR Henipulate GMR's control handles to follow track	1/ 2/
4:1116	SMR's control handle	Recall function and operation of lase buttons	1,2/
4:111	ent 2 Control Reneile	wecast sunction and operation of less sections	1,2/
Unit Humber:	10		
litle:	Coax Engagements		
Se 44 10 4	U-COFT/VIGS		
AND LOUIS DON'T DON'T			
6:1	Fully operational FCS & Machine gun target(s)	Engage target with the coaxial mechine gun	
	Fully operational FCS & Machine gun target(s) Fire command Return within/beyond 200m of estimated range	Engage target with the coaxial machine gun GNR sets/checks FCS/TIS switches for coax engagement TC announces FIRE & GNR fires bursts/GNR relaxes to target	

Ot ject ive Number	Condition(s) Under Which Action is Performed	In Whic	Units h Action ained ^a
Unit Number:	11		-
Title: Device/Hedium:	Degraded Mode Gunnery IB/S, GAS, EMER, & MAN U-COFT		
9.1:1	[Surprise sit. OR Ineff. LRF] & Target w/in B/S range	Engage target using battlesight gunnery	
9.1:IIa	Battlesight fire command	TC presses MANUAL RNG button & adjusts w/ ADD/DROP switch	8/
	Battlesight fire command	GMR sets switches for bettlesight engagement	3/
	Range indexed & Switches set	Continue as precision engagement without ranging to target	•
	TC station controls Hoving target	Recall function & operation of manual range controls GNR leads target while tracking	8/
	Direction of target movement & Ammunition	Indicate appropriate aiming point to manually lead target	/12
9.10:I		Engage target using GAS	
9.10:IIa	Acquired target	TC includes range element in FC & lays gun	
	Fire command with range element	GMR sets/checks FCS switches for GAS engagement	
	Target visible/not visible in GAS	GIR announces IDENTIFIED/CANNOT IDENTIFY	
	Aluing point on target	TC announces FIRE & GMR fires at target	
9.10:176	Fire command & GAS reticle Stabilization failure	Indicate appropriate aiming point on reticle Engage target in emergency mode	
	fire command	GIR sets FCS/TIS suitches for emergency mode engagement	
9.11:1	Turret power failure	Engage target in manual mode	
9.12:Ile	Acquired target	TC includes range/direction elements in FC & lays gun	
9.12:IIe	Hoving target	GMR tracks target using menual controls	
	Failure to fire using elevation crank trigger	GMR turns blasting machine handle vigorously 3-4 times	
	GMR's menual controls & Target Target track	Operate manual controls to set aiming point on target Manipulate manual controls to follow track	
Unit Humber:	The second secon		
Title: Device/Hedium:	Degraded Mode Gunnery IISystem Failures Classroom/Hand-Held Tutor		
9.2:1	Ineffective URF	Engage target using one of three techniques	
	Target within battlesight range	Use bettlesight gunnery	
	GPS operative	Henuelly Index range	
9.2:IIc	GPS inoperative Fire commend without/with INDEX <range></range>	Use GAS TC/GMR Indexes range	
	Computer control panel	Retrieve/store data in ballistic computer	3/
9.4:1	No range display	Engage target using one of two techniques	
9.4:11a	Little or no time	Continue as precision engagement w/out evaluating range	
	Time permitting	TC Instructs GMR to announce range on CCP display	
	Announced range	Evaluate announced return & Continue as precision engagement	t
9.5:1	Crosswind sensor failure Indication of crosswind sensor failure	Engage target	
	Canceled crosswind sensor input	GMR cancels cressuled input to bellistic computer Continue as precision engagement	
	Output from computer self-test	Determine status of fire control system	3/
	Cent sensor failure	Engage target	
9.6:IIa	Indication of cant sensor fallure	GIR cancels cant sensor input to ballistic computer	
9.6:IIb	Hoving tank	TC commands DRIVER STOP & DVR stops smoothly	6/
	Tank on unlevel ground	SIR modifies aiming point	
	Hodified aiming point	Continue as precision engagement	
	Direction of cant & Range to target Lead angle sensor failure	Determine appropriate compensation for cant	
9.7:1	Indication of lead angle sensor failure	Engage target GAR cancels lead angle sensor input to ballistic computer	
	Hoving target	GIR leads target while tracking	11/
	Lead applied to moving target	Continue as precision engagement	•••
	Direction of target movement & Ammunition	Indicate appropriate siming point to manually load target	11/
	GPS fallure	Engage target using either TIS or GAS	
	GPS fallere	Use TIS	
	GPS failure & TIS failure	Use GAS	
	Fire comend	GR sets suitches for TIS viewing	
	TIS Image Procision fire command	Continue as precision engagement Engage target using precision gunnery	
	Battlesight fire commend	Engage target using bettlesight gunnery	
		(table co	e taune t
		(casia coi	IN THE PARTY OF

Objective Number	Condition(s) Under Which Action is Performed	To-Be-Trained Action	Other Units n Which Action Is Trained ^a
Unit Humber:	13		
Title: Medium/Device:	Adjustment of Fire U-COFT		
5:I	Fully operational FCS/FCS in degraded mode	Apply reengagement/standard adjustment technique	
5:11a 5:11b	Target destroyed/not destroyed No subsequent fire command CR TC announces REFERCAGE	TC announces cease fire/GNR announces observation GNR reengages target	
5:11c	No subsequent fire command/subsequent fire command	GRR applies standard adjustment/TC issues correction	
5:111a	Relation between round and target	Recall appropriate observation term	
5:1116	GMR control handles	Recall function and operation of palm switches	1,2/
5:111c 5:111d	Observation OR TC correction Observation	Indicate adjusted aiming point on reticle Issue subsequent fire command	
Unit Humber:	14		
Title: Medium/Device:	Multiple Returns U-COFT		
4:IIf	Return within/beyond 200m of estimated range	TC announces FIRE/GMR relases to target	2,9/
4:IIIh	LRF display	Interpret meaning of LRF symbol(s)	1/
9.3:1	Hultiple returns from LRF	Engage target using one of two techniques	
	Hultiple return	TC commands RELASE & GMR relases to target	
	Return from relase	Evaluate return & Continue as precision engagement	
9.3:110	Hultiple return	TC Indexes range	
Unit Humber:	15		
Title:	Assess Results of Engagement		
Med lum/Dev Ice:	Classroom		
11:1	Engagement concluded & Mission continues	Assess results of engagement	
11:110	Bett le casua It les	TC determines if/how crew should go to 3-man configure	t ion
11:116	Engagement concluded	TC Issues SPOTREP	
11:IIc	> 5 rounds fired in engagement & Hission continues	GMR updates muzzle reference sensor	
11:IIe	Orders to change route OR to move between firing positions	TC Issues driver command & DVR responds	6/
11:IIf	Engagement Concluded	LDR checks replenisher reservoir & removes spent casin	gs
11:IIIa 11:IIIb	Hissing creamember	Describe appropriate reassignment of tank crew duties Recall elements of SPOTREP	
Unit Humber:	16.		
Title: Hedium/Device:	Multiple TargetsBasic Knowledges Classroom/EIDS		
3:11c	Acquired target(s)	TC issues fire command	1/
3:111	Terget range/type & FCS status	Select weapon/asso and firing mode (precision/degraded	- •
3:1110	Number of targets & Target classification	Determine crewmen and fire command (sql, mult, or sim)	•
3: IVb	Target array	Classify target as most dangerous/dangerous/least dang	
7:I	Multiple main gun targets	Engage multiple targets with the main gun	/18,19
7:11a	Multiple fire command	Engage greatest threat using precision gunnery	/16
7:116	Terget destroyed/not destroyed	Adjust fire/engage mext target	/18
7:11c	No targets romaining	TC ennounces CEASE FIRE	/18
8:1	Hachinegun target & Hain gun target	Engage simultaneous targets with the main gun and cal	
8:IIa	Simultaneous fire command	TC engages machinegum target with cal .50	/16
8:IIb	Machine gun target destroyed/not destroyed	TC announces TC COMPLETE/adjusts fire	/16

Objective Number	Condition(s) Under Which Action is Performed	In t	ther Units Mich Action Trained
Unit Humber:	17		
Title: Hedium/Device:	Simultaneous EngagementsPractice U-COFT		
8:1	Machinegum target & Main gum target	Engage simultaneous targets with the main gun and cal .:	50 16/
8: I I a	Simultaneous fire command	TC engages machinegum target with cal .50	16/
8:116	Hackine gun target destroyed/not destroyed	TC ennounces TC COMPLETE/adjusts fire	16/
8:IIc	Simultaneous fire command	GNR engages main gun target using precision gunnery	
8:114	Hein gun target destroyed/not destroyed	GNR announces TARGET CEASE FIRE/adjusts fire	
8:IIIa	CMS controls	Operate CMS controls to traverse, elevate, and fire cal .50	8/
Init Humber:	18		
lit le:	Hultiple EngagementsPractice		
Medium/Device:	U-COFT		
7:1	Multiple main gun targets	Engage multiple targets with the main gun	16/19
7:11a	Hultiple fire command	Engage greatest threat using precision gunnery	16/
7:11b	Target destroyed/not destroyed	Adjust fire/engage next target	16/
7:11c	No targets remaining	TC announces CEASE FIRE	16/
Init Number:	19		
itle:	Tactical Gunnery Exercise		
ted tum/Dev tce :			
4:1	Fully operational FCS & Single main gun target	Engage target using precision gunnery techniques	2,9/
4:IIg	Fire commend & Howing/stationary tank	LDR sets switch on EL UNCPL/POWERED & loads round	5/
4:IIh	Fire commend & Moving/stationary tank	DVR maintains steady platform/moves turret- to hull-down	
4:1111	LDR's control panel	Recall function of GUN/TURRET DRIVE switch	5/
6:11h	Fire command & Hoving tank	DVR meintains steedy platform	6/
7:1	Hultiple main gun targets	Engage multiple targets with the main gun	16,18/
10:I	SMR cannot identify target OR GMR is absent	Engage target from the tank commander position	8/

Numbers before the slash indicate previous units in which the objective is trained; numbers after the slash indicate subsequent units. No entry indicates that the objective is trained only in the instructional unit under which it is listed.